*Your Dreams Our Goal*

# POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

# FACULTY OF COMPUTER SCIENCE & ENGINEERING

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

# SCHEME & SYLLABUS BOOKLET

## B.Tech. BATCH 2023-2027

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**Disclaimer:** The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

**Student Details**

Name of Student:

Name of Program:

Semester: Year: Batch:

Faculty of:

Your Dreams Our Goal

# POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

## *VISION*

To create knowledge based society with scientific temper, team spirit and dignity of labor to face global competitive challenges.

## *Mission*

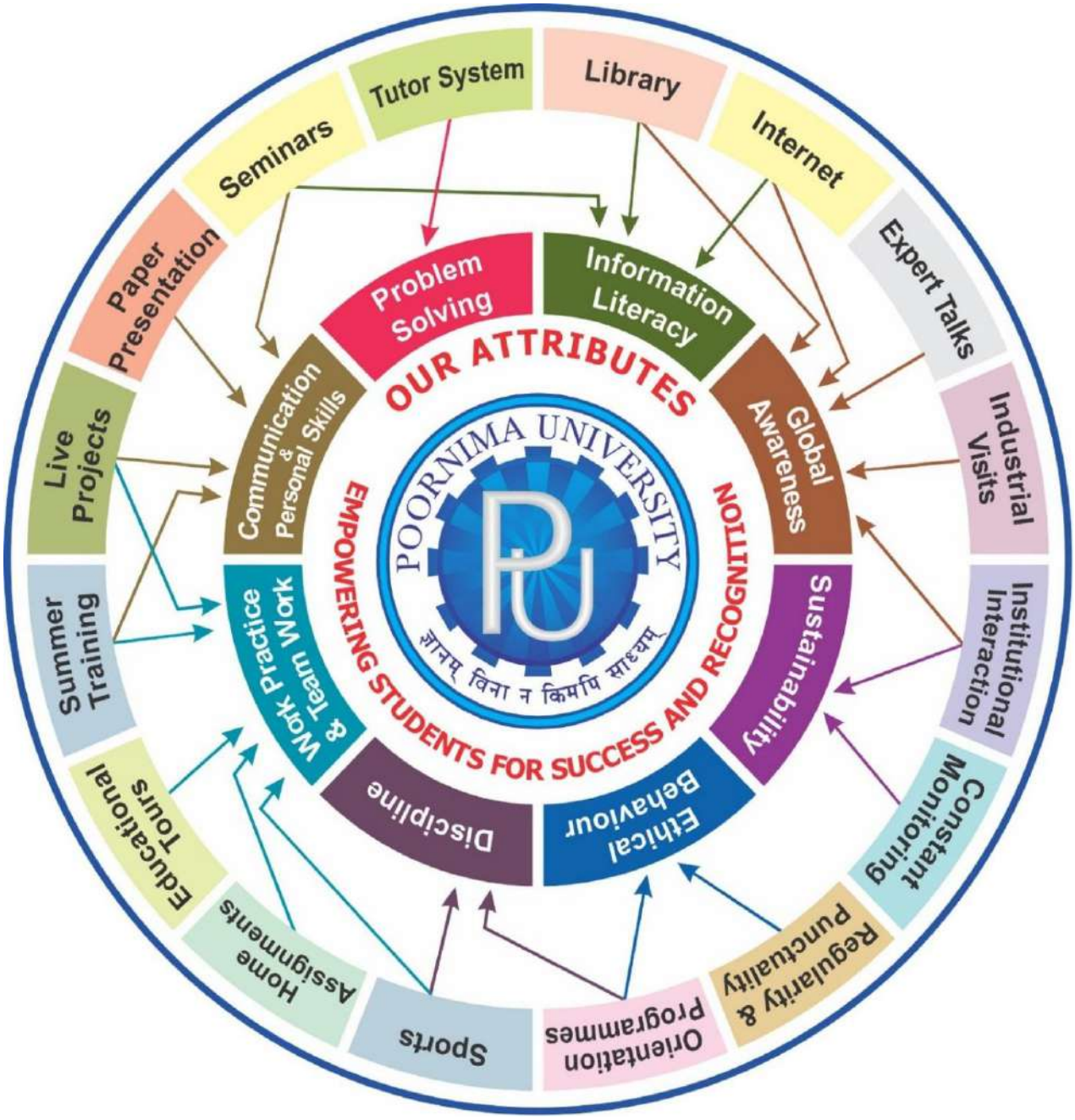
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

## *Quality Policy*

To provide Quality Education through Faculty development, updating of facilities and continual improvement meeting University norms and keeping stake holders satisfied.

# *Knowledge Wheel*

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.



## About Program and Program Outcomes (PO):

**Title of the Programme:** Bachelor of Technology (B. Tech.)

**Nature of the Programme:** B. Tech. is four year full-time programme.

## Program Outcomes (PO) :

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

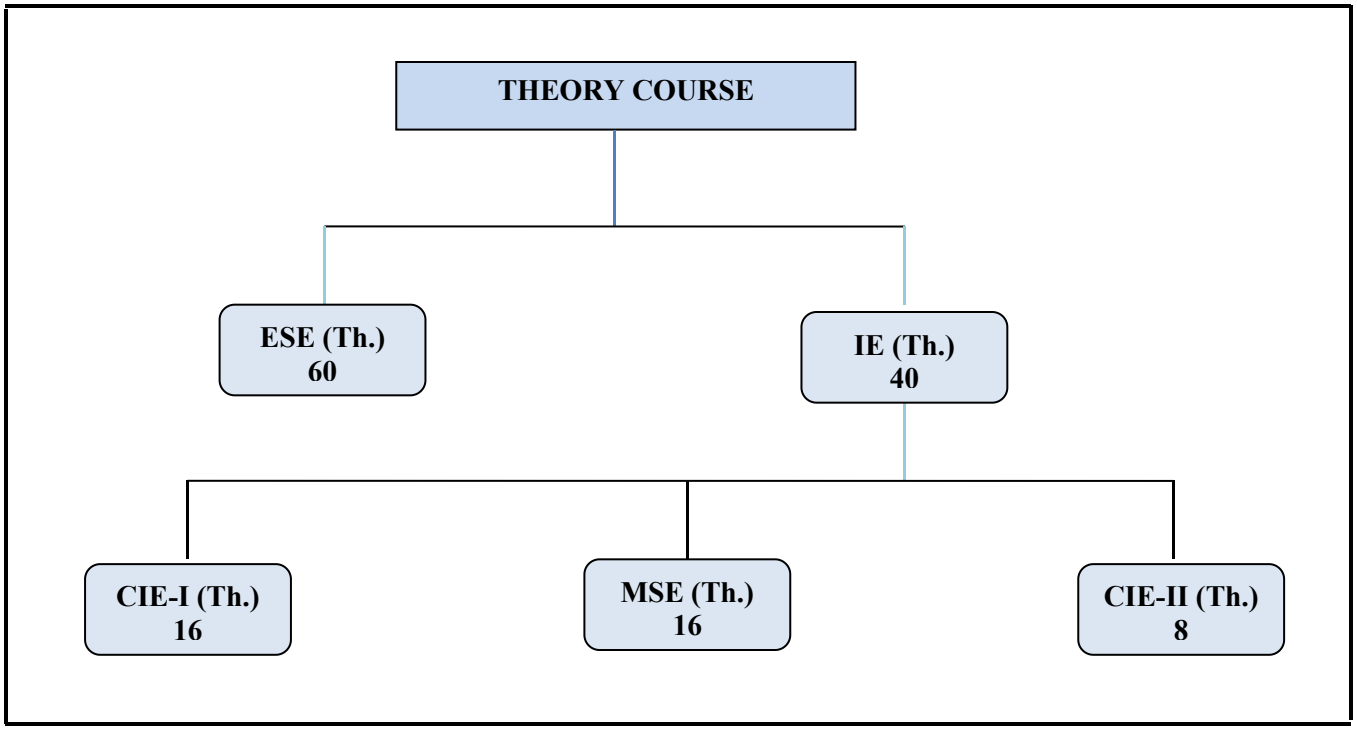
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

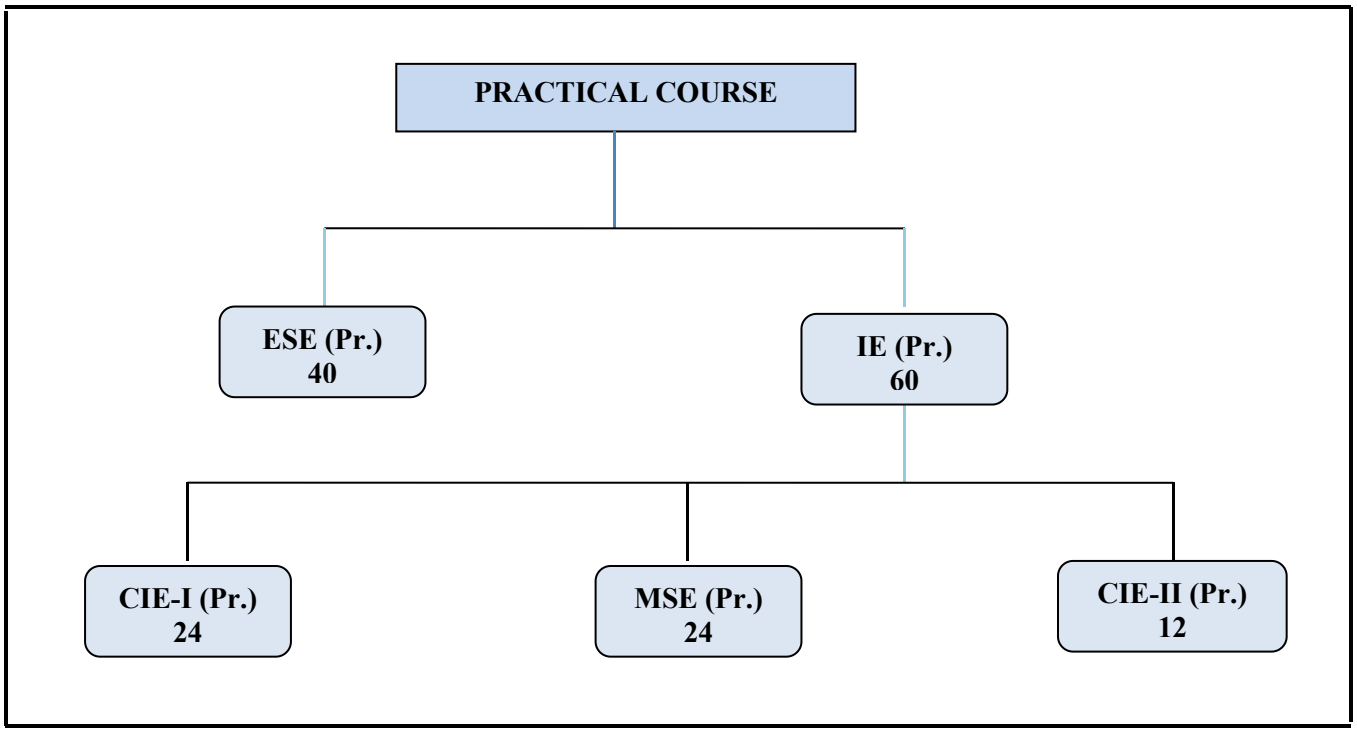
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Examination System :**

A. **Marks Distribution of Theory Course:**




B. **Marks Distribution of Practical Course :**




**Th**.: Theory, Pr**.**: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

**CO Wise Marks Distribution:**

| Exam Entity | Theory Subject | | Practical/ Studio Subject | |
|---|---|---|---|---|
| | Maximum Marks | CO to be Covered | CO to be Covered | Maximum Marks |
| **CIE-I** | 16 ( 8 + 8) | 1 & 2 | 1 & 2 | 24 (12 + 12) |
| **MSE** | 16 ( 8 + 8) | 3 & 4 | 3 & 4 | 24 (12 + 12) |
| **CIE-II (Activity/ Assignment )** | 8 (8) | 5 | 5 | 12 (12) |
| **ESE** | 60 | - | - | 40 |
| **TOTAL** | 100 | - | - | 100 |

**Minimum Passing Percentage in All Exams:**

| S No. | Program Name | Minimum Passing Percentage in | | |
|---|---|---|---|---|
| | | IE Component | ESE Component | Total Component |
| **1** | Course Work for PhD Registration | **-** | **-** | **50%** |
| **2** | B. Arch. | **-** | **45%** | **50%** |
| **3** | MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH | **-** | **40%** | **40%** |
| **4** | MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH | **-** | **35%** | **35%** |

## SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

$C_i$ is the number of credits of subject i,

$G_i$ is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

## CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

$C_i$ is the number of credits of subject i,

$G_i$ is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

## Grading Table:

**Applicable for B.Arch. & Ph.D. Courses**

| Academic Performance | Grade | Grade Point | Marks Range (in %) |
|---|---|---|---|
| Outstanding | O | 10 | 90≤ x ≤100 |
| Excellent | A+ | 9 | 80≤ x <90 |
| Very Good | A | 8 | 70≤ x <80 |
| Good | B+ | 7 | 60≤ x <70 |
| Above Average | B | 6 | 50≤ x <60 |
| Fail | F | 0 | x <50 |
| Absent | Ab | 0 | Absent |

**Applicable for All Courses except B.Arch. & Ph.D.**

| Academic Performance | Grade | Grade Point | Marks Range (in %) |
|---|---|---|---|
| Outstanding | O | 10 | 90≤ x ≤100 |
| Excellent | A+ | 9 | 80≤ x <90 |
| Very Good | A | 8 | 70≤ x <80 |
| Good | B+ | 7 | 60≤ x <70 |
| Above Average | B | 6 | 50≤ x <60 |
| Average | C | 5 | 40≤ x <50 |
| Pass | P | 4 | 35≤ x <40 |
| Fail | F | 0 | x <35 |
| Absent | Ab | 0 | Absent |

## CGPA to percentage conversion rule:

**Equivalent % of Marks in the Program = *CGPA* *10**

## Award of Class

| CGPA | Percentage | Equivalent Division |
|---|---|---|
| 7.50 ≤ CGPA | 75% or more | First Division with Distinction |
| 6.00 ≤ CGPA < 7.50 | 60% ≤ x <75% | First Division |
| 5.00 ≤ CGPA < 6.00 | 50% ≤ x <60% | Second Division |
| 4.00 ≤ CGPA < 5.00 | 40% ≤ x < 50% | Pass Class |

# Guidelines for Massive Open Online Courses (MOOCs)

**(Session 2023-24)**

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM and NPTEL.

## 1. Introduction of MOOCs: SWAYAM and NPTEL

### About SWAYAM:

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through a platform that facilitates hosting of all the courses, taught in classrooms to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. However learners wanting a SWAYAM certificate should register for the final proctored exams that come at a fee and attend in-person at designated centers on specified dates. Eligibility for the certificate will be announced on the course page and learners will get certificates only if this criteria is matched.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.

In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

1. AICTE (All India Council for Technical Education) for self-paced and international courses
2. NPTEL (National Programme on Technology Enhanced Learning) for Engineering
3. UGC (University Grants Commission) for non-technical post-graduation education
4. CEC (Consortium for Educational Communication) for under-graduate education
5. NCERT (National Council of Educational Research and Training) for school education
6. NIOS (National Institute of Open Schooling) for school education
7. IGNOU (Indira Gandhi National Open University) for out-of-school students
8. IIMB (Indian Institute of Management, Bangalore) for management studies
9. NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

Two types of courses are offered on SWAYAM platform: Credit Courses and Non- Credit Courses. Credit courses are offered for each semester in January and July every year. The list is available on SWAYAM official website: https://onlinecourses.swayam2.ac.in/

### About NPTEL:

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

### Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects

- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers
- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

### NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.
Some statistics regarding the open online courses since March 2014 till Dec 2021
Completed courses: 3496;
Enrollments across courses: 1.58 CRORE +
Number of exam registrations: 15.1 LAKH +
All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses.
All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

## 2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

### (a) Options for MOOCs at Poornima University

**(For this document, only those MOOCs will be considered which are available on SWAYAM & NPTEL platforms)**

- Credit and Non-credit SWAYAM MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- In case of credit courses, there are two ways to opt these courses for the purpose of credit transfer to PU system as given below:

### OPTION–I: As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards):

Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards) are available at University level in offline mode for which relevant booklets are already published. **These courses carries 02 credits.** These category/type of courses (similar/different) are also available as MOOC courses. The respective Deans / HODs shall provide both the options to all the students to either select offline courses or MOOCs as per details given below:

- Deans / HODs shall prepare a list of upto 05 appropriate MOOC courses of 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits **(only 02)** of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
- If the students are not willing to opt for MOOC Open Elective/ Multidisciplinary course, they can proceed with the current offline practice of opting for Multidisciplinary courses.

- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.

**OR**

## OPTION–II: As Major / Minor Courses:

- Deans / HODs shall identify a course of **03 credits** for each semester, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students citing that the particular course will be conducted through MOOCs only and is compulsory for all respective students. The credits of this course will be counted against Major/Minor courses pertaining to that particular semester.
- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.
- This is to be noted that if Deans / HODs decide to conduct any major/minor course in any semester through MOOCs, no offline course will be conducted against that.

## (b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- Last period of T/T/S shall be taken for MOOC courses which shall be in self-study mode.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no exam will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- SWAYAM will award a certificate to all the students passing the examination along with the credit earned. The center of examination for SWAYAM MOOCs will be finalized by SWAYAM. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.
- Any student who would not be able to register/present/clear/pass the MOOC in the stipulated time, it is the choice of the student that he or she may register in next semester (odd or even) with MOOC again or appear as a back exam candidate of the University as per PU norms.
- There will be no provision of re-evaluation of MOOC.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.

**NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.**

**Attached Items:**

| | |
|---|---|
| Open Elective Booklet | Annexure-1 |
| Soft Skills Booklet | Annexure-2 |
| Value Added Course Booklet | Annexure-3 |

**POORNIMA UNIVERSITY, JAIPUR**

**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **otal Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-I**

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits | |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | SH | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| BTXCSA1101 | Basic Science for Engineers | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BTXCCE1102 | Fundamental of Computer | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BTXCME1103/ BTXCEE1104 | Basics of Civil Engineering / Basics of Electrical and Electronics Engineering | 3 | - | - | 2* | 40 | 60 | 100 | 3 |
| BTXCSA1105/ BTXCME1106 | Engineering Mathematics / Basic of Mechanical Engineering | 3 | - | - | 2* | 40 | 60 | 100 | 3 |
| **A.2** | **Practical** | | | | | | | | |
| BTXCSA1201 | Basic Science lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BTXCCE1202 | Programming in C Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BTXCCV1203/ BTXCEE1204 | Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab | - | 1 | 2 | | 60 | 40 | 100 | 1 |
| BTXCME1205/ BTXCME1206 | Workshop Practice/Engineering Graphics | - | 1 | 2 | | 60 | 40 | 100 | 1 |
| BTXCCE1207 | Exploratory Project | - | - | 2 | | 60 | 40 | 100 | 1 |
| **B.** | | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | **Theory** | | | | | | | | |
| **B.2** | **Practical** | | | | | | | | |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | | - | - | - | | | | | |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU1101 | English | 2 | - | - | | 40 | 60 | 100 | 2 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE1201 | Skill Enhancement Generic Course-I | - | - | 2 | | 60 | 40 | 100 | 1 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| BUVCSA1102 | Environmental Studies | 2 | - | - | | 40 | 60 | 100 | 2 |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | | | | | | | | | |
| **Total** | | 16 | 2 | 12 | 6* | | | | |
| **Total Teaching Hours** | | **30/36** | | | | | | | |

SH: Supporting Hours

- Classes will be conducted fortnightly

**POORNIMA UNIVERSITY, JAIPUR**

**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-II**

| Course Code | Name of Course | Teaching Scheme | | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | SH | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| BTXCCE2101 | Python | 3 | - | - | 2* | 40 | 60 | 100 | 3 |
| BTXCCV2102/ BTXCEE2103 | Basic of Civil Engineering / Basics of Electrical and Electronics Engineering | 3 | - | - | 2* | 40 | 60 | 100 | 3 |
| BTXCSA2104/ BTXCME2105 | Engineering Mathematics / Basic of Mechanical Engineering | 3 | - | - | 2* | 40 | 60 | 100 | 3 |
| **A.2** | **Practical** | | | | | | | | |
| BTXCCE2201 | Programming in Python Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BTXCCV2202/ BTXCEE2203 | Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab | - | 1 | 2 | | 60 | 40 | 100 | 1 |
| BTXCME2205/ BTXCME2206 | Workshop Practice/Engineering Graphics | - | 1 | 2 | | 60 | 40 | 100 | 1 |
| BTXCCE2207 | Exploratory Project | - | - | 2 | | 60 | 40 | 100 | 1 |
| **B.** | | Minor Stream Courses/ **Department Electives** | | | | | | | |
| **B.1** | **Theory (Any One)** | | | | | | | | |
| BTXECE2111<br>BTXECE2112<br><br>BTXECE2113<br>BTXECE2114<br>BTXECE2115<br>BTXEME2116 | • Introduction to AI&DS<br>• Introduction to Cyber Security<br>• Introduction to Cloud<br>• Introduction to Game Tech.<br>• Digital Electronics<br>• Engineering Mechanics | 3 | - | - | | 40 | 60 | 100 | 3 |
| **B.2** | **Practical** | | | | | | | | |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | MOOC Course-I | 2 | - | - | | | | | 2 |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU2204 | Language Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE2201 | Skill Enhancement Generic Course-II | - | - | 2 | | 60 | 40 | 100 | 1 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| BUVCPH2102 | Health Behavior in Communication | 2 | - | - | | 40 | 60 | 100 | 2 |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | | - | - | - | | | | | |
| **Total** | | 16 | 2 | 12 | 6* | | | | **22** |
| **Total Teaching Hours** | | **30/36** | | | | | | | |

**SH: Supporting Hours**

***Classes will be conducted fortnightly**

**POORNIMA UNIVERSITY, JAIPUR**
**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with Minor AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-III**

| Course Code | Name of Course | Teaching Scheme | | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | SH | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| BCECCE3101 | Introduction to Web Technology | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE3102 | Data Structures and Algorithms | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE3103 | Operating System | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **A.2** | **Practical** | | | | | | | | |
| BCECCE3201 | Web Technology Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE3202 | Data Structures and Algorithms Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE3203 | Linux Operating System Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE3204 | Office Automation Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **B.** | | Minor Stream Courses/ **Department Electives** | | | | | | | |
| **B.1** | **Theory** | | | | | | | | |
| BCEECE03111 / BCEECE03112 | Software Engineering/SAS Programing in Viya | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCEECE03121 / BCEECE03122 / BCEECE03123 / BCEECE03124 / BCEECE03125 / BCEECE03126 | Theory Of Computation/Statistical Foundation Of Data Science/Analytics Programming Fundamental/Cyber Criminal Law & IPR/Instalation & Configuration Server/Introduction To UI/UX | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **B.2** | **Practical** | | | | | | | | |
| | - | | | | | | | | |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | MOOC Course-II | 1 | - | - | 1* | 40 | 60 | 100 | 2 |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU3208 | Communication Skills-I | - | - | 2 | | 40 | 60 | 100 | 1 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE3201 | Skill Enhancement Generic Course-III | - | - | 2 | | 60 | 40 | 100 | 1 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| BUVCCE3101 | Digital Marketing | 2 | - | - | | 40 | 60 | 100 | 2 |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | - | 18 | | 12 | 6* | | | | **25** |
| **Total Teaching Hours** | | **30/36** | | | | | | | |

SH: Supporting Hours
Classes will be conducted fortnightly

**POORNIMA UNIVERSITY, JAIPUR**
**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-IV**

| Course Code | Name of Course | Teaching Scheme | | | SH | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| BCECCE4101 | Computer Networks | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE4102 | OOPS With Java | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE4103 | Relational Database Management System | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE4104 | Advance Data Structure | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **A.2** | **Practical** | | | | | | | | |
| BCECCE4201 | Computer Networks Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE4202 | OOPS With Java Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE4203 | Relational Database Management System lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| | **Minor Stream Courses**/ Department Electives | | | | | | | | |
| **B.1** | **Theory** | | | | | | | | |
| BAMCCE4101 | SAS® Enterprise Guide®: ANOVA, Regression, and Logistic Regression | 3 | - | - | 1* | 40<br>40 | 60 | 100 | 3 |
| **B.2** | **Practical** | | | | | | | | |
| BAMCCE4201 | Application of Machine Learning Using SAS(R) Viya® Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **C** | | **Multidisciplinary Courses (MC)** | | | | | | | |
| | MOOC Course-III | 1 | - | - | 1* | 40 | 60 | 100 | 2 |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU4212 | Communication Skills-II | - | - | 2 | | 60 | 40 | 100 | 1 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE4201 | Skill Enhancement Generic Course-IV | - | - | 2 | | 60 | 40 | 100 | 1 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| BUVCCE4102 | Business Intelligence | 2 | - | - | | 40 | 60 | 100 | 2 |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | | | | | | | | | |
| **Total** | | 18 | - | 12 | 6* | | | | **25** |
| **Total Teaching Hours** | | **30/36** | | | | | | | |

**SH: Supporting Hours**
*Classes will be conducted fortnightly

**POORNIMA UNIVERSITY, JAIPUR**

**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-V**

| Course Code | Name of Course | Teaching Scheme | | | SH | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| BCECCE5101 | Design & Analysis of Algorithms | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE5102 | Advance Java | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE5103 | Information System Security | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **A.2** | **Practical** | | | | | | | | |
| BCECCE5201 | Design & Analysis of Algorithms Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE5202 | Advance Java Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE5203 | Technical Seminar | - | - | 2 | | 60 | 40 | 100 | 1 |
| **B.** | | **Minor Stream Courses**/ Department Electives | | | | | | | |
| **B.1** | **Theory** | | | | | | | | |
| BAMCCE5101 | SAS® Visual Text Analytics in SAS® Viya® | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BAMCCE5102 | R Programming | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **B.2** | **Practical** | | | | | | | | |
| BAMCCE5201 | Neural network: Essentials (SAS) Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BAMCCE5202 | R Programming Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | MOOC Course-IV | 1 | - | - | 1* | 40 | 60 | 100 | 2 |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU5218 | Professional Skills-I | - | - | 2 | | 60 | 40 | 100 | 1 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE5201 | Skill Enhancement Generic Course-V | - | - | 2 | | 60 | 40 | 100 | 1 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| | | - | - | - | | | | | |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | | | | | | | | | |
| **Total** | | 16 | - | 14 | 6* | | | | **24** |
| **Total Teaching Hours** | | **30/36** | | | | | | | |

**SH: Supporting Hours**
*Classes will be conducted fortnightly

**POORNIMA UNIVERSITY, JAIPUR**

**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-VI**

| Course Code | Name of Course | Teaching Scheme | | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | SH | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | | |
| BCECCE6101 | Big Data Analytics | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE6102 | Computer Architecture | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BCECCE6102 | SalesForce | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | | |
| BCECCE6201 | Big Data Analytics Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE6202 | SalesForce Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **B.** | | **Minor Stream Courses**/ Department Electives | | | | | | | |
| **B.1** | Theory | | | | | | | | |
| BAMCCE6101 | Natural Language Processing | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BAMCCE6102 | Deep Learning Using SAS® Software | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **B.2** | Practical | | | | | | | | |
| BAMCCE6201 | Natural Language Processing Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BAMCCE6202 | Deep Learning and Computer Vision Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | MOOC Course-V | 1 | - | - | 1* | 40 | 60 | 100 | 2 |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU6223 | Professional Skills-II | - | - | 2 | | 60 | 40 | 100 | 1 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE6201 | Skill Enhancement General Courses-VI | - | - | 2 | | 60 | 40 | 100 | 1 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| | - | - | - | - | | | | | |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| BCECCE6401 | Industrial Training Seminar-I | - | - | 2 | | 60 | 40 | 100 | 1 |
| **Total** | | 16 | - | 14 | 6 * | | | | 24 |
| **Total Teaching Hours** | | **30/36** | | | | | | | |

**SH: Supporting Hours**

*Classes will be conducted fortnightly

**POORNIMA UNIVERSITY, JAIPUR**

**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

| | **Semester-VII** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Name of Course** | **Teaching Scheme** | | | | **Marks Distribution** | | | **Credits** |
| | | **Lecture (L)** | **Tutorial (T)** | **Practical (P)** | **SH** | **IE** | **ESE** | **Total** | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| BCECCE7101 | Data Mining Techniques and Applications | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **A.2** | **Practical** | | | | | | | | |
| BCECCE7201 | Data Mining Techniques and Application Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BCECCE7202 | Internet of Things (IoT) Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **B.** | | **Minor Stream Courses**/ Department Electives | | | | | | | |
| **B.1** | **Theory** | | | | | | | | |
| BAMCCE7101 | Optimization Concepts for Data Science and Artificial Intelligence | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| BAMCCE7102 | Data Handling & Visualization | 3 | - | - | 1* | 40 | 60 | 100 | 3 |
| **B.2** | **Practical** | | | | | | | | |
| BAMCCE7201 | Forecasting Using Model Studio in SAS® Viya® Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| BAMCCE7202 | Data Handling & Visualization Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | NIL | | | | | | | | |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| BUACHU7226 | Comparative Literature Lab | - | - | 2 | | 60 | 40 | 100 | 1 |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| BULCSE7201 | Skill Enhancement Technical Courses-I | 2 | - | - | | 40 | 60 | 100 | 2 |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| | - | - | - | - | | | | | |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| BCECCE7301 | Minor Project | - | - | 4 | | 60 | 40 | 100 | 2 |
| BCECCE7401 | Industrial Training Seminar-II | | | 2 | | 60 | 40 | 100 | 1 |
| **Total** | | 11 | - | 16 | 3* | | | | **19** |
| **Total Teaching Hours** | | **27 / 30** | | | | | | | |

SH: Supporting Hours

*Classes will be conducted fortnightly

**POORNIMA UNIVERSITY, JAIPUR**

**Faculty of Computer Science and Engineering**

**Name of Program: B.Tech. in CE with AI & ML With SAS** **Duration: 4 Years** **Total Credits: 171**

**Teaching Scheme for Batch 2023-27**

**Semester-VIII**

| Course Code | Name of Course | Teaching Scheme | | | SH | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | | IE | ESE | Total | |
| **A.** | | **Major (Core Courses)** | | | | | | | |
| **A.1** | **Theory** | | | | | | | | |
| | NIL | | | | | | | | |
| | | | | | | | | | |
| **A.2** | **Practical** | | | | | | | | |
| | NIL | | | | | | | | |
| | | | | | | | | | |
| **B.** | | **Minor Stream Courses/Department Electives** | | | | | | | |
| **B.1** | **Theory** | | | | | | | | |
| | NIL | | | | | | | | |
| | | | | | | | | | |
| **B.2** | **Practical** | | | | | | | | |
| | NIL | | | | | | | | |
| **C** | | **Multidisciplinary Courses** | | | | | | | |
| | NIL | - | - | - | | | | | |
| **D** | | **Ability Enhancement Courses (AEC)** | | | | | | | |
| | NIL | - | - | - | | | | | |
| **E** | | **Skill Enhancement Courses (SEC)** | | | | | | | |
| | NIL | - | - | - | | | | | |
| **F** | | **Value Added Courses (VAC)** | | | | | | | |
| | NIL | - | - | - | | | | | |
| **G** | | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| BCECCE8301 | Major Project | | | 20 | | 60 | 40 | 100 | 10 |
| | | | | | | | | | |
| **Total** | | | | 20 | | | | | **10** |
| **Total Teaching Hours** | | **20** | | | | | | | |

**SH: Supporting Hours**

*Classes will be conducted fortnightly

| Code: BTXCSA1101 | Basic Science for Engineers | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOMES**

The Students will be able:

- Point out the basic principles of relativity, twin paradox and energy-mass relations
- Produce coherent sources and phenomenon of interference
- To learn about the laser and apply it for suitable applications manufacturing of cement and the chemistry involved in setting and hardening of it.
- To use their knowledge of polymers and its use in industries and daily life.
- To develop innovative methods to produce soft water for industrial use and potable water at cheaper cost

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit(Hours) |
|---|---|---|
| 1. | Special Theory of Relativity | 07 |
| 2. | Wave Optics | 07 |
| 3. | Laser & Binding Materials | 08 |
| 4. | Polymer | 08 |
| 5. | Water Technology | 06 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Special Theory of Relativity** |
| | • Introduction of Unit<br>• Inertial and non-inertial frames of Reference.<br>• Postulates of special theory relativity<br>• Galilean and Lorentz Transformations, Length contraction and Time Dilation.<br>• Relativistic Mass-Energy relation<br>• Conclusion of Unit |
| 2. | **Wave Optics** |
| | • Introduction of Unit<br>• Interference of light**:** Types of interference,<br>• Coherent source, methods to produce coherent sources with examples.<br>• Newton's Rings: Principle, Construction, working &Applications<br>• Conclusion of Unit |
| 3. | **Laser & Binding Materials** |
| | • Introduction of Unit<br>• Theory of laser action: Einstein's Coefficients, Components of laser, Threshold conditions for laser action<br>• Theory, Design and Applications of He-Ne Laser<br>• Cement: Composition and Significance of cement<br>• Manufacturing of Portland cement by Rotary Kiln Technology<br>• Chemistry of setting and hardening of cement and role of gypsum<br>• Conclusion of Unit |
| 4. | **Polymer** |
| | • Introduction of Unit<br>• Classification of Polymers and Types of polymerization<br>• Plastics: Constituents of plastics, Thermosets and Thermoplastics, Preparation, Properties and Uses of Polyethylene, Bakelite, Teflon and Nylon<br>• Elastomers: Natural rubber, Vulcanization, Synthetic rubber- Preparation, Properties and Applications of |

| | |
|---|---|
| | SBR, Buna-N, Butyl and Neoprene rubber<br>• Conclusion of Unit |
| **5.** | **Water Technology** |
| | • Introduction of Unit<br>**Water**<br>• Sources of water, Impurities in water and effect of impurities<br>• Municipal water supply: Requisites of drinking water, Steps involved in purification of water, Sedimentation, Coagulation, Filtration and Disinfection, Break Point Chlorination<br>**Water Analysis**<br>• Hardness of water; Type of hardness, Degree of hardness, Units of hardness, Disadvantages of hard water, Determination of hardness by Complexometric (EDTA) method.<br>• Treatment of hard water: Lime-soda method, Permutit (zeolite) method and Deionization or Demineralization method<br>• Desalination: Reverse osmosis, Electrodialysis<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Fundamental of Optics | Jenkins and While | 4th | Tata McGraw-Hill |
| 2. | Optics | Ajoy Ghatak | 3rd | Tata McGraw-Hill |
| 3. | Introduction to special Theory of Relativity | R. Resnick | Latest | Johan Willy Singapore |
| 4. | Engineering Chemistry | P.C. Jain | Latest | Dhanpat Rai&Sons |
| 5. | Engineering Chemistry | S. S. Dara | Latest | S. Chand & Co |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **3** | **2** | **2** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **3** | **2** | **3** | **3** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **2** | **2** | **1** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **3** | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **2** | **2** | **1** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 2 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 2 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Developmen

| Code: BTXCCE1102 | Fundamental of Computer | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**Course Outcomes: -**

Students will be able to:

- Learn data types, loops, functions, array, pointers, string, structures and files.
- Develop conditional and iterative statements to write C programs.
- Implement concept of string using array.
- Allocate memory dynamically using pointers.
- Apply C Programming to solve real time problems.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to C Programming** | 6 |
| 2. | **Decision Making & Looping** | 6 |
| 3. | **Array and string** | 8 |
| 4. | **Advance programming in C** | 8 |
| 5. | **File handling & Additional features** | 8 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to C Programming** |
| | • Introduction of Unit<br>• Introduction to computer-based problem solving, Program design and implementation issues- Flowcharts & Algorithms.<br>• Types of Languages – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters.<br>• Overview of C, Data Types, Constants & Variables, Literals, Operators & Expressions<br>• Conclusion &Real Life Application |
| 2. | **Decision Making & Looping** |
| | • Introduction of Unit<br>• Decision making in C- if statement, if-else statement, Nested if statement, if else if Ladder, Switch case<br>• Loop control in C – for loop, while loop<br>• Control flow in C- break, continue and goto statement.<br>• Conclusion &Real Life Application |
| 3. | **Array and string** |
| | • Introduction of Unit<br>• Array- 1D array, 2D array<br>• Scope rules- Local & global variables.<br>• Functions-parameter passing call by value and call by reference, calling functions with arrays, command line argument.<br>• String – String in-build functions.<br>• Conclusion of the Unit |
| 4. | **Advance programming in C** |
| | • Introduction of Unit<br>• Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions.<br>• Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers.<br>• Conclusion of the Unit |
| 5. | **File handling & Additional features** |
| | • Introduction of Unit<br>• File Handling – The file pointer, file accessing functions-fopen, fclose, putc, getc, fprintf, reading and writing into a file |

| | |
|---|---|
| | • Advance features- storage classes and dynamic memory allocation<br>• C Preprocessor- #define, #include, #undef.<br>• C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions.<br>• Conclusion of the Unit |

**C. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Letus C, 6th Edition | Yashwant Kanitkar | PBP Publication | Letus C ,6th Edition |
| 2. | The C programming Language | Richie and Kenninghan | BPBPublication,2004 | The C programming Language |
| 3. | Programming in ANSI C3rd Edition, 2005 | E.Balagurusamy | Tata McGraw Hill | Programming in ANSIC 3rd Edition, 2005 |
| **Reference Book** | | | | |
| 1. | The C programming Language Richie and Kenninghan PBP Publication,2004 | | | |
| 2. | Programming in ANSI C 3rd Edition, 2005 Balaguruswmy Tata McGraw Hill | | | |
| **Online Resources** | | | | |
| 1. | https://www.programiz.com/c-programming/examples | | | |
| 2. | https://www.w3resource.com/c-programming-exercises | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **3** | **2** | **2** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **3** | **2** | **3** | **3** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **2** | **2** | **1** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **3** | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **2** | **2** | **1** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 2 | - | - |
| **CO4** | **3** | - | - |
| **CO5** | 2 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

**Code: BTXCME1103/BTXCCV2102 Basics of Civil Engineering 3 Credits [LTP: 3-0-0]**

**Course Outcomes: -**

Students will be able :

- To interpret various aspect, Novel areas and Career Prospects in Civil Engineering
- To learn about the use of different Construction Materials and techniques in Civil Engineering
- To identify the various building components, method of constructions and basic principles.
- To understand types of surveying works required
- To learn about the advancements in Civil Engineering

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Civil Engineering** | 08 |
| 2. | **Construction Materials and techniques** | 08 |
| 3. | **Building Construction** | 08 |
| 4. | **Basic Surveying** | 08 |
| 5. | **Advancements in Civil Engineering** | 08 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Civil Engineering** |
| | • Introduction<br>• Different disciplines of Civil Engineering, Scope and prospects<br>• Role of a Civil Engineer<br>• Units of measurement, Unit conversion (Length, Area, Volume)<br>• Heritage structures, architecture<br>• Infrastructure Engineering. Sustainability<br>• Automation and Robotics in Construction<br>• Novel areas in Construction industry<br>• Career Prospects in Civil Engineering |
| 2. | **Construction Materials and techniques** |
| | • Introduction<br>• Stone, Requirements of good building stone, General types of stone used in Construction.<br>• Bricks, Modular and Standard bricks, Characteristics of good brick, Field tests on Bricks, Special bricks –fly ash bricks.<br>• Timber, Structure of timber, General properties and uses of good timber, Use of bamboo in construction<br>• Properties of lime, its types and uses<br>• Asphalt, bitumen and tar used in construction, their properties and uses<br>• Types of Stone Masonry (Rubble masonry, Ashlar Masonry) and Brick Masonry (English bond and Flemish bond). |
| 3. | **Building Construction** |
| | • Introduction<br>• Classification of Buildings as per National Building Code Group A to I<br>• Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure |

| | |
|---|---|
| | • Building Components - Functions of Building Components, Substructure-Foundation, Plinth & Superstructure.<br>• Selection of site for different types of Buildings<br>• Basic principles of building planning. |
| **4.** | **Basic Surveying** |
| | • Introduction<br>• Survey – Principles, purpose and use<br>• Types & Classification of surveying<br>• Instruments used in chain survey: Chains, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square<br>• Ranging: Direct and Indirect Ranging<br>• Methods of chaining, obstacles in chaining.<br>• Errors in chain and tape, Numerical based on errors in length due to incorrect length of chain & tape. |
| **5.** | **Advancements in Civil Engineering** |
| | • Introduction<br>• Smart city and it's features<br>• Mass Transportation systems-BRTS, Metro<br>• Rain water harvesting systems, Watershed Management<br>• Green building, Energy efficient building<br>• Development of River fronts<br>• Heritage structures & its conservations<br>• Features of affordable housing. |

**C.RECOMMENDED STUDY MATERIAL**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Basics of Civil Engineering | S.S. Bhavikatti | Latest | New Age International Publishers |
| 2 | Basic Civil Engineering | B C Punmia, Ashok K Jain, Arun K Jain | Latest | Laxmi Publications |
| 3. | Basic Civil Engineering | G K Hiraska | Latest | Dhanpat Rai Publication |
| 4. | Basic Civil Engineering | Jhonson Victor D and Esther Malini | Latest | Allied Publishers Limited, Madras |
| 5. | Basic Civil Engineering | Arunachalam N | Latest | Pratheeba Publishers, Coimbatore |
| **Important Web Links** | | | | |
| 1. | https://nptel.ac.in/courses/105106201 | | | |
| 2. | https://onlinecourses.nptel.ac.in/noc20_ce02/preview | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 3 | 1 | 2 | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 1 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | - | 3 |
| **CO2** | 2 | - | 3 |
| **CO3** | 1 | - | 3 |
| **CO4** | 1 | - | 3 |
| **CO5** | 2 | - | 3 |

**Code: BTXCEE1104/BTXCEE2103 Basics of Electrical and Electronics 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

The student will be able to:

- Apply basic electrical concepts, including various circuit analysis techniques and fundamentals of theorem, in practical applications.
- Analyze the fundamentals of AC circuits such as the R.M.S value, average value, active power, reactive power, power factor, form factor, peak factor and their applications.
- Analyze the energy conversion process and fundamentals of rotating and stationary electrical machines with their application in real life.
- Analyze the working of semiconductor devices such as Diode, BJT, UJT, photovoltaic cells, filters and fundamentals of digital electronics.
- Illustrate the concepts of Communication systems and Instrumentation engineering in practical applications.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Basic Concepts of Electrical Engineering** | 08 |
| 2. | **Alternating Quantities and Electrical Installations** | 08 |
| 3. | **Energy Conversion and Electrical Machines** | 07 |
| 4. | **Basic Electronics** | 08 |
| 5. | **Communication Systems and IoT** | 08 |

**A. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Basic Concepts of Electrical Engineering** |
| | • Introduction of Unit<br>• Basic Concepts: Electric Current, Electromotive Force, Electric Power, Ohm's Law, Basic Circuit Components, Faraday's Law of Electromagnetic Induction.<br>• DC Network Analysis & Theorems: Kirchhoff's Laws, Network Sources, Resistive Networks, Series-Parallel Circuits, Star-Delta Transformation, Node Voltage Method, Mesh Current Method, Super- Position, Thevenin's, Norton's and Maximum Power Transfer Theorems.<br>• Conclusion of Unit |
| 2. | **Alternating Quantities and Electrical Installations** |
| | • Introduction of Unit<br>• Single Phase AC system: Introduction, Generation of AC Voltages, Root Mean Square and Average Value of Alternating Currents and Voltages, Form Factor, Peak Factor, Power Factor and Quality Factor, Phasor Diagram<br>• Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries. Elementary calculations for energy consumption and savings, battery backup.<br>• Conclusion of Unit |
| 3. | **Energy Conversion and Electrical Machines** |
| | • Introduction of Unit<br>• Introduction to Energy: Types of Energy, Introduction to Energy Conversion, Sources of Energy (Conventional & Non-Conventional), Energy Scenario in India & Rajasthan.<br>• Rotating Machines: DC Machines: Principle of Operation of DC Machine as Motor and Generator, EMF Equation, Applications of DC Machines. AC Machines: Principle of Operation of 3-Phase Induction Motor, 3- Phase Synchronous Motor and 3- Phase Synchronous Generator (Alternator), Applications of AC Machines. |

| | |
|---|---|
| | • Conclusion of Unit |
| **4.** | **Basic Electronics** |
| | • Introduction of Unit<br>• Semiconductor Devices: Conduction in Semiconductors, Conduction Properties of Semiconductor Diodes, Behavior of the PN Junction, PN Junction Diode, Zener Diode, LED, Photovoltaic Cell, Rectifiers, L, C, & L-C filters, BJT, UJT, Transistor as an Amplifier.<br>• Digital Electronics: Boolean algebra, Binary System, Logic Gates and Their Truth Tables.<br>• Conclusion of Unit |
| **5.** | **Communication Systems and IoT** |
| | • Introduction of Unit<br>• Basics of Communication: Introduction, IEEE Spectrum for Communication Systems, Types of Communication, Amplitude and Frequency Modulation.<br>• Basics of Instrumentation: Introduction to Transducers, Thermocouple, RTD, Strain Gauges, Load Cell and Bimetallic Strip.<br>• An overview of Internet of Things-Building blocks of IoT, IoT enabling technologies, Characteristics of IoT systems and IoT levels, Evolution of the Internet paradigm, Device-to-Device/ Machine-to-Machine Integration<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Electrical and Electronic Technology | Edward Hughes et al, | Latest | Pearson Publication |
| 2 | Basic Electrical & Electronics Engineering | V. Jagathesan, K. Vinod Kumar & R. Saravan Kumar | Latest | Wiley India |
| 3 | Basic Electrical & Electronics Engineering | Van Valkenburge | Latest | Cengage learning |
| 4 | Basic Electrical and Electronics Engineering by, | Muthusubrmaniam | Latest | TMH |
| 5 | Basic Electrical & Electronics Engineering | Ravish Singh | Latest | TMH |
| **Important Web Links** | | | | |
| 1 | https://nptel.ac.in/courses/108108076/ | | | |
| 2 | https://nptel.ac.in/courses/117103063/ | | | |
| 3 | https://nptel.ac.in/courses/108/101/108101091/ | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | - | - | 1 | - | - | - | - | - |
| **CO2** | 3 | 2 | 3 | 3 | - | - | 2 | - | - | - | - | - |
| **CO3** | 2 | 2 | 1 | 1 | - | - | 2 | - | - | - | - | - |
| **CO4** | 3 | 1 | 2 | 1 | - | - | 2 | - | - | - | - | - |
| **CO5** | 2 | 2 | 1 | 1 | - | - | 2 | - | - | - | - | - |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | – | 3 |
| **CO2** | 2 | – | 3 |
| **CO3** | 1 | – | 3 |
| **CO4** | 1 | – | 3 |
| **CO5** | 2 | – | 3 |

**Code: BTXCSA1105/BTXCSA2104 Engineering Mathematics 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

The student would be able:

- To analyze and prove relationships between matrices, rank of matrix and systems of equations, Inverses.
- To analyze the basic structure of differential equations, and order and degree of the first order and first degree and its simple applications
- To calculate asymptotes of different curves. They will be able to know fundamentals of tracing the various types of cures and asymptotes play a main role in tracing.
- To utilize methods of integration to evaluate volumes and surface of objects and lengths of curves.
- To apply vector differentiation, and integration in the scalar and vector fields

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Matrices** | **07** |
| 2 | **Ordinary Differential Equations** | **08** |
| 3 | **Applications of Differential Calculus** | **08** |
| 4 | **Integral Calculus** | **08** |
| 5 | **Introduction Vector Calculus** | **08** |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Matrices** |
| | • Introduction of Unit<br>• Rank of a Matrix, Normal form of a Matrix<br>• Consistency of systems of linear equations<br>• Eigen Values and Eigen Vectors<br>• Cayley-Hamilton Theorem (without proof)<br>• Conclusion of Unit |
| **2.** | **Ordinary Differential Equations** |
| | • Introduction of Unit<br>• First order and first-degree differential equations-Separable Variables,<br>• Homogenous and reducible to homogenous equation<br>• Linear Equation and reducible to linear form, Exact Equation<br>• Linear differential equations with constant coefficients<br>• Conclusion of Unit |
| **3.** | **Applications of Differential Calculus** |
| | • Introduction of Unit<br>• Asymptotes<br>• Multiple points<br>• Curve tracing for standard Curves (Cartesian Curves only)<br>• Conclusion & Real life applications |
| **4.** | **Integral Calculus** |
| | • Introduction of Unit<br>• Gamma functions and their properties, beta function ( only definition)<br>• Double integrals, Double integral by changing into polar form, Areas by Double Integration<br>• Change of order of integration<br>• Conclusion of Unit |
| **5.** | **Vector Calculus** |
| | • Introduction of Unit<br>• Scalar and Vector field<br>• Differentiation and Integration of Vector functions<br>• Gradient, Divergence and Curl, Directional derivatives<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Higher Engineering Mathematics | B S Grewal | Latest | Khanna Publications, Delhi, |
| 2. | Higher Engineering Mathematics | Ramana, B.V | Latest | Tata McGraw-Hill. |
| 3 | Engineering Mathematics: A Tutorial Approach | Ravish R Singh and M Bhatt | Latest | Tata McGraw-Hill |
| 4 | Calculus and Analytical Geometry | Thomas and Finney, | Latest | Narosa Publishing, New Delhi |
| 5 | Advanced Engineering Mathematics | Erwin Kreyszig | Latest | John Wiley and Sons |
| **Important Web Links:** | | | | |
| 1 | https://nptel.ac.in/courses/111105134/ | | | |
| 2 | https://nptel.ac.in/courses/122/101/122101001/ | | | |
| 3 | https://www.classcentral.com/course/swayam-engineering-mathematics-i-13000 | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | – | – | – | – | – | – | – | – |
| CO-2 | 3 | 2 | 1 | 2 | – | – | – | – | – | – | – | – |
| CO-3 | 2 | 3 | 2 | 1 | – | – | – | – | – | – | – | – |
| CO-4 | 2 | 2 | 2 | 1 | – | – | – | – | – | – | – | – |
| CO-5 | 2 | 3 | 1 | 1 | – | – | – | – | – | – | – | – |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | – | – |
| CO-2 | 2 | – | – |
| CO-3 | 1 | – | – |
| CO-4 | 2 | – | – |
| CO-5 | 2 | – | – |

**Code:BTXCME1106/BTXCME2105 Basic of Mechanical Engineering 3 Credits [LTP: 3-0-0]**

## COURSE OUTCOME

The student would be able to:

- Analyze various metal forming processes
- Illustrate application of IC engine
- Analyze various application of refrigeration and air conditioning
- List out various electrical devise
- Analyze various ergonomics design

### A. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Primary Manufacturing Processes** | **08** |
| 2 | **IC Engines** | **08** |
| 3 | **Refrigeration and Air Conditioning and Aerodynamics** | **07** |
| 4 | **Electric Vehicles** | **08** |
| 5 | **Ergonomics** | **07** |

### B. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1** | **Primary Manufacturing Processes** |
| | • Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces.<br>• Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing.<br>• Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering. |
| **2** | **IC Engines** |
| | • Classification - SI and CI engine operation - two stroke and four stroke engines - construction - working principle. Theoretical and actual indicator diagrams - calculation of power - efficiency.<br>• Valve and port timing diagram - stages of combustion in SI and CI engine - abnormal combustion - combustion chamber. |
| **3** | **Refrigeration and Air Conditioning and Aerodynamics** |
| | • Introduction, classification and types of refrigeration systems and air-conditioning.<br>• Applications of refrigeration and Air-conditioning.<br>• Basics of aerodynamics, Jet propulsion. |
| **4** | **Electric Vehicles** |
| | • Architecture of an electric vehicle<br>• Essentials and performance of electric vehicles –Traction motor characteristics, tractive effort, transmission requirements<br>• Vehicle performance, energy consumption, advantage and limitations. |
| **5** | **Ergonomics** |
| | • Introduction<br>• Seating dimensions, interior ergonomics<br>• Ergonomics system design, seat comfort, suspension seats, split frame seating, back pain reducers<br>• Dash board instruments, electronic displays, commercial vehicle cabin ergonomics, mechanical package layout, goods vehicle layout. |

**C. RECOMMENDED STUDY MATERIAL**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Basics of Mechanical Engineering | Punia | Latest | Dhanpat Rai |
| 2 | Basics of Mechanical Engineering | R.K. Rajput | Latest | Laxmi |
| 3 | Basics of Mechanical Engineering | DS Kumar | Latest | Kataria |
| **Important Web Links** | | | | |
| 1 | NPTEL | | | |
| 2 | Khan Academy | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 3 | 1 | 2 | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 1 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | – | 3 |
| **CO2** | 2 | – | 3 |
| **CO3** | 1 | – | 3 |
| **CO4** | 1 | – | 3 |
| **CO5** | 2 | – | 3 |

| Code: BTXCSA1201 | Basic Science lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOMES**

Students will be able to:

- Learn the concept of interference by the help of Newton's ring & Michelson Interferometer
- Learn the dispersive power of the material of the prism & resolving power of the telescope
- analyze hardness strength of Ferrous Ammonium sulphate solution and CuSO4 solution.
- analyze hardness of water
- handle different instruments & analytical techniques

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | To determine the wavelength of sodium light by using Newton's Ring. |
| 2 | To determine the coherent length and coherent time by using He-Ne-Laser. |
| 3 | To measure the numerical aperture of an optical fiber by He-Ne laser. |
| 4 | To determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of spectrometer. |
| 5 | To specify the specific resistance of a material of a wire by carey Foster Bridge. |
| 6 | To determine the dispersive power of a prism for violet, yellow and red colour of mercery light with the help of spectrometer |
| 7 | To determine the strength of $CuSO_4$ solution with the help of hypo solution |
| 8 | To determine the strength of Ferrous Ammonium sulphate solution with the help of $K_2Cr_2O_7$ solution using diphenyl amine as internal indicator |
| 9 | To determine the hardness of water by EDTA method. |
| 10 | Synthesis of Bakelite |
| 11 | To determine the viscosity of a given lubricating oil by Redwood viscometer |
| 12 | To determine the flash and fire point of a given lubricating oil |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **1** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **2** | **3** | **3** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **3** | **2** | **2** | **3** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **2** | **1** | **1** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **3** | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 1 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXCCE1202 | Programming in C Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOME: -**

Students will be able to:

- Gain concept of functional hierarchical code organization.
- Work with textual information, characters and strings
- Implement file handling concepts
- Implement real time applications using the power of C language features.
- Overcome and solve possible errors during program execution.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Given the values of the variables x, y and z, write a program to rotate their values such that x has the value of y, y has the value of z, and z has the value of x |
| **2** | Write a program that reads a floating point number and then displays the right-most digit of the integral part of the number. |
| **3** | Write a C program to calculate the sum of digits of given number. |
| **4** | Program to find largest and smallest number from four given number. |
| **5** | Program to find whether a year is leap or not |
| **6** | Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number. |
| **7** | Write a C Program to convert Decimal number to Binary number |
| **8** | Find the sum of this series upto n terms<br>1+2+3+4+5+6+…….. |
| **9** | Program to print Armstrong's numbers from 1 to 100. |
| **10** | Write a program to convert years into Minute, Hours, Days, Months, Seconds using switch () statements |
| **11** | Write a C menu driven program |
| **12** | Write a program to generate the various pattern of numbers |
| **13** | Write a C Program to print the reverse of an integer number |
| **14** | Write a C program to perform the factorial of given number |
| **15** | Write a C program in which a function prime that returns 1 if its argument is a prime and return zero otherwise. |
| **16** | Write a C program to calculate factorial of a number using recursion. |
| **17** | Write a C program in which enter 10 elements by the user and perform the operation of sorting in ascending order |
| **18** | Write a C program to perform to perform Matrix addition and multiplication operations. |
| **19** | Write a program to determine the length of the string and find its equivalent ASCII codes. |
| **20** | Write a program to delete all the occurrences of the vowels in a given text. Assume that the text length will be of one line |
| **21** | Write a program to maintain the library record for 100 books with book name, author's name, and edition, year of publishing and price of the book. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Let us C | Yashwant Kanetkar | 6th Edition | PBP Publication |
| 2 | The C programming Language | Richie and Kenninghan | 2nd Edition | PBP Publication,2004 |

| | | | | |
|---|---|---|---|---|
| | | | 2004 | |
| 3 | Programming in ANSI C | E Balaguruswamy | 3rd Edition, 2005 | Tata McGraw Hill |
| **Reference Book** | | | | |
| 1. | The C programming Language by Richie and Kenninghan, PBP Publication,2004 | | | |
| 2. | Programming in ANSI C 3rd Edition, 2005 by E.Balagurusamy, Tata McGraw Hill | | | |
| **Online Resources** | | | | |
| 1. | https://www.programiz.com/c-programming/examples | | | |
| 2. | https://www.w3resource.com/c-programming-exercises | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| **CO2** | 2 | 3 | 3 | 1 | - | - | 2 | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | 3 | - | - | 2 | - | - | - | - | - |
| **CO4** | 2 | 1 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| **CO5** | 3 | 1 | 2 | 1 | - | - | 2 | - | - | - | - | - |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 1 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

**Code: BTXCCV1203/BTXCCV2202 Computer Aided Design (CADD) 1 Credits [LTP:0-1-2]**

**COURSE OUTCOMES:-**

Students will be able to:

- Apply basic concepts to develop construction (drawing) techniques.
- Analyze drawings through editing and plotting techniques
- Apply basic tools to develop outlines in drawings.
- Apply tools to control and manage the drawings in AutoCAD for different purposes
- Create the layout of plans in workspace.

**A. LIST OF EXPERIMENTS**

| | |
|---|---|
| 1. | • Introduction to AutoCAD and Drawing Tools<br>• Draw Different Shapes using Line, Polyline Circle, and Polygon. |
| 2. | • Draw Different Shapes using Rectangle<br>• Use of Dimensions in Circle, rectangles, Line and other shapes. |
| 3. | • Modify Drawings in AutoCAD using Modification Tools.<br>• Offset and Mirror Different Shapes and Lines. |
| 4. | • Use Trim, Extend &Align, Scale and Strech Command. |
| 5. | • Use of Text, Line, Block and Conversion Tools. |
| 6. | • Introduction to Layers, How to add, Modify layers in layer manager. |
| 7. | • Introduction of Hatch Command in AutoCAD |
| 8. | • Opening and Modifying properties in AutoCAD. |
| 9. | • Layout Design of Building |
| 10. | • 2D Plan of Residential Structure |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | – | – | – | – | – | – | – | – |
| **CO2** | 2 | 3 | 1 | 2 | – | – | – | – | – | – | – | – |
| **CO3** | 3 | 2 | 2 | 2 | – | – | – | – | – | – | – | – |
| **CO4** | 3 | 3 | 1 | 2 | – | – | – | – | – | – | – | – |
| **CO5** | 3 | 3 | 2 | 2 | – | – | – | – | – | – | – | – |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | – | 3 |
| **CO2** | 2 | – | 3 |
| **CO3** | 1 | – | 3 |
| **CO4** | 1 | – | 3 |
| **CO5** | 2 | – | 3 |

| Code: BTXCEE1204/BTXCEE2203 | Basics of Electrical and Electronics lab | 1 Credits [LTP:0-1-2] |
|---|---|---|

**COURSE OUTCOMES:-**

Students will be able to:

- Analyze the house wiring connections of various equipments such as energy meter, ceiling fan, tubelight etc.
- Create the connections of single phase and three phase induction motors.
- Create circuits and connects of various electrical components such as Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, etc.
- Analyze the effect of L, C and L-C filters in single phase half wave and full wave bridge rectifier
- Analyze the effect of LC and LC filters in current and power rectifiers

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | Assemble house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring. |
| 2 | Prepare the connection of ceiling fan along with the regulator and vary the speed. |
| 3 | Prepare the connection of single phase induction motor through 1-Phase Auto-transformer and vary the speed. |
| 4 | Prepare the connection of three phase squirrel cage induction motor through 3-Phase Autotransformer and vary the speed. |
| 5 | Prepare the connection of Fluorescent Lamp, Sodium Vapour and Halogen Lamp and measure voltage, current and power in the circuit. |
| 6 | Identification, testing and application of Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, BJT, Photo Diode, Photo Transistor, Analog/Digital Multi- Metres and Function/Signal Generator. |
| 7 | Measure the frequency, voltage, current with the help of CRO. |
| 8 | Assemble the single phase half wave and full wave bridge rectifier & the analyse effect of L, C and L-C filters in rectifiers. |
| 9 | Study the BJT amplifier in common emitter configuration. Measure voltage gain plot gain frequency response and calculate its bandwidth. |
| 10 | Verify the truth table of AND, OR, NOT, NOR and NAND gates |
| 11 | Prepare the connection of sodium lamp and measure voltage |
| 12 | Analyze the effect of LC and LC filters in current and power rectifiers |
| **Virtual Lab** | |
| 1 | http://vlabs.iitkgp.ernet.in/be/ |
| 2 | http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | – | – | – | – | – | – | – | – |
| **CO2** | 2 | 3 | 1 | 2 | – | – | – | – | – | – | – | – |
| **CO3** | 3 | 2 | 2 | 2 | – | – | – | – | – | – | – | – |
| **CO4** | 3 | 3 | 1 | 2 | – | – | – | – | – | – | – | – |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO5** | 3 | 3 | 2 | 2 | – | – | – | – | – | – | – | – |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|
| **CO1** | 1 | – | 3 |
| **CO2** | 2 | – | 3 |
| **CO3** | 1 | – | 3 |
| **CO4** | 1 | – | 3 |
| **CO5** | 2 | – | 3 |

**Code: BTXCME1205/BTXCME2205 WORKSHOP PRACTICE 1 Credit [ LTP: 0-1-2]**

**COURSE OUTCOMES:-**

Students will be able to:

- Create a model of T Lap and T- Briddle Joint through carpentry shop
- Analyze the making of prototype model through foundry shop
- Analyze the difference between gas welding and arc welding and their applications
- Create a model on fitting shop through filling, drilling and tapping operation
- Analyze the difference between forging, moulding and casting

**A. LIST OF EXPERIMENTS**

| | |
|---|---|
| 1 | **Carpentry Shop**<br>• Timber, definition, engineering applications, seasoning and preservation<br>• Plywood and ply boards |
| 2 | **Foundry Shop**<br>• Moulding Sands, constituents and characteristics<br>• Pattern, definition, materials types, core prints<br>• Role of gate, runner, riser, core and chaplets<br>• Causes and remedies of some common casting defects like blow holes, cavities, inclusions |
| 3 | **Welding Shop**<br>• Definition of welding, brazing and soldering processes and their applications<br>• Oxyacetylene gas welding process, equipment and techniques, types of flames and their applications<br>• Manual metal arc welding technique and equipment, AC and DC welding<br>• Electrodes: Constituents and functions of electrode coating, welding positions<br>• Types of welded joints, common welding defects such as cracks, undercutting, slag inclusion and boring |
| 4 | **Fitting Shop**<br>• Files, materials and classification. |
| 5 | **Smithy Shop**<br>• Forging, forging principle, materials<br>• Operations like drawing, upsetting, bending and forge welding<br>• Use of forged parts |

**List of Jobs to be made in the Workshop Practice**

| | |
|---|---|
| 1. | **Carpentry Shop**<br>1. T – Lap joint<br>2. Bridle joint |
| 2. | **Foundry Shop**<br>3. Mould of any pattern |
| 3. | **Welding Shop**<br>4. Square butt joint by MMA welding<br>5. Lap joint by MMA welding |
| 4. | **Machine Shop Practice**<br>6. Job on lathe with facing operation<br>7. Job on lathe with one step turning and chamfering operations<br>8. Job on shaper for finishing two sides of a job |
| 5. | **Fitting Shop**<br>9. Finishing of two sides of a square piece by filing<br>10. Drilling operation on fitted job (two holes)<br>11. Slotting operation on fitted job<br>12. Tapping operation on fitted job |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| **CO2** | 2 | 3 | 1 | 2 | — | — | — | — | — | — | — | — |
| **CO3** | 3 | 2 | 2 | 2 | — | — | — | — | — | — | — | — |
| **CO4** | 3 | 3 | 1 | 2 | — | — | — | — | — | — | — | — |
| **CO5** | 3 | 3 | 2 | 2 | — | — | — | — | — | — | — | — |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | — | 3 |
| **CO2** | 2 | — | 3 |
| **CO3** | 1 | — | 3 |
| **CO4** | 1 | — | 3 |
| **CO5** | 2 | — | 3 |

**Code: BTXCME1206/BTXCME2206** **Engineering Graphics** **1 Credit [LTP: 0-1-2]**

**COURSE OUTCOME: -**

Students will be able to:

- Apply the concept of scale and their applications
- Analyze the different applications of conic section and engineering curves and also how to draw on sheet
- Analyze the use of projection and also analyze the difference between first and third angle projection method
- Apply the concepts of sectioning, true section and apparent section and create the sectional views of the engineering components.
- analyze the development of surface and analyze the sheet metal requirement for fabricating a surface.

**A. List of Experiments**

| | |
|---|---|
| 1. | • Lines, Lettering and Dimension (Sketch Book)<br>• Scales: Representative Fraction, plain scales, diagonal scales, (In drawing sheet 1) |
| 2. | • Conic Sections: Construction of ellipse, parabola and hyperbola by different methods( in drawing sheet) Engineering Curves: Construction of Cycloid, Epicycloids, Hypo-cycloid( in drawing sheet 2) |
| 3. | • Type of Projection, Orthographic projection: first angle and third angle projection (in drawing sheet)<br>• Projection of Points<br>• Projection of Straight lines<br>• Projection of planes: Different positions of plane lamina like: regular polygon, circle of three planes (four problems in drawing sheet)<br>• Projection of Solids: Projection of right and regular polyhedron, cone (four problem in drawing sheet 3) |
| 4. | • Orthographic Projections (3 Problems in drawing sheet 4) |
| 5. | Sectional Views (2 Problems) and Riveted joints, lap joints, butt joints, chain riveting (drawing sheet 5) |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| **CO2** | 2 | 3 | 1 | 2 | — | — | — | — | — | — | — | — |
| **CO3** | 3 | 2 | 2 | 2 | — | — | — | — | — | — | — | — |
| **CO4** | 3 | 3 | 1 | 2 | — | — | — | — | — | — | — | — |
| **CO5** | 3 | 3 | 2 | 2 | — | — | — | — | — | — | — | — |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | — | 3 |
| **CO2** | 2 | — | 3 |
| **CO3** | 1 | — | 3 |
| **CO4** | 1 | — | 3 |
| **CO5** | 2 | — | 3 |

| Code: BTXCEE1207/BTXCCE2207 | Exploratory Project | 1 Credits [LTP: 0-0-1] |
|---|---|---|

**LAB OUTCOMES**: After Successful completion of the lab students will be able to-

**LO1** Predict a problem of current relevance to society
**LO2** Formulate the problem and identify suitable modelling paradigm
**LO3** Categorize the problem and identify the solution methodology
**LO4** Simulate and design systems using various modern tools
**LO5** Validate the results and prepare a project report

**GUIDELINES:**

- The Project group must complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
- The group should maintain a log book of activities. It should have entries related to the worked one, problems faced, solution evolved etc., duly signed by guide.
- The guides should regularly monitor the progress of the project work.
- The project work along with project report should be submitted as part of term work in first term on or before the last day of the second term.
- Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
- Assessment of the project forward of marks shall be done by the guide and a departmental committee.
- The guide should be internal examiner for oral examination.
- The external examiner should be from the related area of the concerned project. He should have experience at degree level / industry.
- The evaluation at final oral examination should be done jointly by the internal and external examiner.

**Phases:**
Project work is divided into the following phases:
**Phase I**

- Allocation of groups(Max. 4 Members & Min. 2 Members) & guide
- Black board presentation on topics as per the choice & feasibility
- Submission of abstract & synopsis of the project

**Phase II**

- Procurement of the components
- 2D/3D figure or model
- Paper work like any circuit diagram and tentative cost

**Phase III**

- Working Model of the project
- Mounting the components
- Final hardware evaluation/presentation
- Submission of the final hardware to the coordinator.

**Phase V**

- Final report submission (after project exhibition)
- Paper presentation on the selected project in seminars /conferences/journals
- Viva voce

**Deadlines of Phases:**
The Project will be covered in 13 weeks from starting of semester. The time allocated to each phase is as follow:
Phase -1: Maximum 2 weeks
Phase -2: Maximum 3 weeks
Phase -3: Maximum 6 weeks

Phase- 4: Maximum 2 weeks

**Distribution of Marks:-**

Total Marks 100

**Break up of marks (**100)

| | |
|---|---|
| Performance of Phase 1 | :15 |
| Performance of Phase 2 | :20 |
| Performance of Phase 3 | :20 |
| Performance of Phase 4 | :45 |
| Total | :**100** |

Note: 1. Performance marks of Phase 1/2/3/4 will be given by Coordinators, Guide and external (if any) on completion of the respective phase.

2. Presentation and demonstration will be taken by Project Coordinator, Guide.

3. Guide feedback will be collected by Project Coordinator.

| Code:BUACHU1101 | English | 2 Credits [LTP: 2-0-0] |
|---|---|---|

**COURSE OUTCOMES:**

The students would be able to

C01: Understand the mechanism of language and linguistic creativity to communicate with each other.
apply writing skills effectively for a variety of professional and social communication

C02: Understand the importance of intonation, word and sentence stress for improving communicative competence and foster social and emotional Learning.

C03: Apply writing skills effectively for a variety of professional and social communication.

C04: understand the structured conversation to make their point of views clear to the listeners by reading short stories written in English.

C05: Apply Literary expressions in academic writing.

## A. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Grammar and Usage I | 7 |
| 2. | Grammar and Usage II | 8 |
| 3. | Composition | 6 |
| 4. | Poems | 8 |
| 5. | Short Stories & Essays | 8 |

## B. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Grammar and Usage I** |
| | • Introduction to the Unit<br>• Tense<br>• Active and Passive Voice<br>• Modals<br>• Articles<br>• Conclusion & Real Life Application |
| 2. | **Grammar and Usage II** |
| | • Introduction to the Unit<br>• Parts of Speech<br>• Direct and Indirect Speech<br>• Conditionals<br>• Conclusion & Real-Life Application |
| 3. | **Composition** |
| | • Introduction to the Unit<br>• Letter writing<br>• Report & Review Writing<br>• Precis Writing<br>• Conclusion & Real-Life Application |
| 4. | **Poems** |
| | • Introduction to the Unit<br>• She walks in Beauty by Lord Byron<br>• Stopping by Woods on a Snowy Evening by Robert Frost<br>• Toads by Philip Larkin<br>• The Indian Weavers by Sarojini Naidu<br>• Conclusion & Real Life Application |
| | |

| 5. | Short Stories & Essays |
|---|---|
| | • Introduction to the Unit<br>• The Birthmark by Nathaniel Hawthorne<br>• The Night Train at Deoli by Ruskin Bond<br>• Shooting an Elephant by George Orwell<br>• Of Adversity by Francis Bacon<br>• Conclusion & Real Life Application |

C: **Recommanded Study Material**

| Sr. No | Reference Book | Author | Publication |
|---|---|---|---|
| 1. | English Literature | Benjamin W. Griffith | 1882 |
| 2. | English Literature: Its History and Significance | William J.Long | 2012 |
| 3. | English Grammar and Composition | Wren & Martin | 2017 |

| BULCSE1201 | Skill Enhancement Generic Course | 1 Credits [ 0-0-2} |
|---|---|---|

**COURSE OUTCOMES: On completion of the course a student will be able to:**

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

| LIST OF ACTIVITIES | |
|---|---|
| 1 | SMART Goals, Goal Setting (IKIGAI), Wheel of Satisfaction, Exchanging pleasantries |
| 2 | Root Words, Prefix-Suffix, Antonyms, Synonyms & Analogies, Sentence Correction-1 |
| 3 | Numbers, Relations & Functions, HCF & LCM, Average & Divisibility |
| 4 | Resume Tips & Resume Review |
| 5 | How to win friends & Influence people, Sentence Correction-2 |
| 6 | Series & Progressions |
| 7 | Number Series & Letter Series, Crypto-arithmetic, SWOT/SWOC |
| 8 | Percentage, Profit & Loss, Ratio Proportion, CI & SI |
| 9 | Mixtures and Allegations, Short Cut Tricks, Seating Arrangement, Sequencing & Ranking |
| 10 | Surds & Indices, Problem on ages, Solving Equations - Quadratic & Linear |
| 11 | Time & Distance, Boats & Streams, Clocks and Calendars |
| 12 | GD, Practice of GD, Reading and Comprehension |

| Code:BUVCSA1102 | Environmental Studies | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSEOUTCOMES:**
Students would be able to:

CO1: Understand the scope of environmental studies and explain the concept of ecology, ecosystem and biodiversity.
CO2: Implement innovative ideas of controlling different categories of Environmental Pollution.
CO3: Explain different environmental issues together with various Environmental Acts, regulationsand International Agreements.
CO4: Summarize social issues related to population, resettlement and rehabilitation of project affected persons and demonstrate disaster management with special reference to floods, earthquakes, cyclones,landslides.
CO5: Determine the local environmental assets with simple ecosystems and identify local flora and fauna.

A. **OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to Environmental Studies | 5 |
| 2. | Environmental Pollution and its Control | 5 |
| 3. | Environmental Policies & Practices | 5 |
| 4. | Human Communities and the Environment | 5 |
| 5. | Field Work | 4 |

B..**DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1 | **Introduction to Environmental Studies** |
| | • Introduction of Unit<br>• Multidisciplinary nature of environmental studies Concept of sustainability and sustainable development.<br>• Ecosystem: Structure and function of ecosystem<br>• Energy flow in an ecosystem: food chains, food webs and ecological succession. Casestudies Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desertecosystem Aquatic ecosystems<br>• Biodiversity and Conservation<br>• Conclusion & Real Life Application |
| 2 | **Environmental Pollution and its Control** |
| | • Introduction of Unit<br>• Environmental pollution: types, causes, effects and controls; Air, water, soil and noisevpollution Nuclear hazards and human health risks<br>• Solid waste management: Control measures of urban and industrial waste.<br>• Pollution case studies<br>• Conclusion & Real Life Application |
| 3 | **Environmental Policies & Practices** |
| | • Introduction of Unit<br>• Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture<br>• Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.<br>• Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.<br>• International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD)<br>• Conclusion & Real Life Application |

| | |
|---|---|
| | |
| **4** | **Human Communities and the Environment** |
| | • Introduction of Unit<br>• Human population growth: Impacts on environment, human health and welfare.<br>• Resettlement and rehabilitation of project affected persons; case studies.<br>• Disaster management: floods, earthquake, cyclones and landslides.<br>• Conclusion & Real Life Application |
| **5** | **Field Work** |
| | • Introduction of Unit<br>• Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.<br>• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.<br>• Study of common plants, insects, birds and basic principles of identification.<br>• Study of simple ecosystems-pond, river, Delhi Ridge, etc.<br>• Conclusion & Real Life Application |

C: **Recommanded Study Material**

| Sr. No | Reference Book | Author | Publication |
|---|---|---|---|
| 1. | Environmental Studies | Erach Barucha | UGC |
| 2. | Environmental Studies | Benny Joseph | Tata Mcgraw Hill |
| 3. | Environmental Studies | R. Rajagopalan | Oxford University Press |
| 4. | Principles of Environmental Science and Engineering | P. Venugoplan Rao | (Prentice Hall of India. |
| 5 | Environmental Science and Engineering | Meenakshi | Prentice Hall India |

# II SEMESTER

| Code: BTXCCE2101 | Python Programming | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME:**

Students will be able to:

- Understand the basic terminology used in computer programming to write, compile and debug programs in Python programming language.
- Use different data types to design programs involving decisions, loops, and functions for problem solving
- Apply various object oriented programming
- Handle the exceptions which are raised during the execution of Python scripts
- Implement files and classes in the Python programming environment

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Python Programming** | 07 |
| 2. | **Python Operators and Control Flow statements** | 09 |
| 3. | **Data Structures, Python Functions and Packages** | 09 |
| 4. | **Object Oriented Programming** | 08 |
| 5. | **File I/O Handling and Exception Handling** | 09 |

B. **DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Python Programming** |
| | • Introduction to Unit<br>• What is Python,<br>• Uses of Python Programming Language / Python Applications<br>• Features of Python Programming Language<br>• Python-2 and Python-3 differences<br>• Python environment setup — Installation and working of IDE<br>• Running Simple Python scripts to display 'welcome' message.<br>• Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of data types<br>• Python building blocks — Identifiers, Keywords, Indention, Variables, Comments<br>• Conclusion of unit |
| 2. | **Python Operators and Control Flow statements** |
| | • Introduction to Unit<br>• Basic Operators: Arithmetic, Comparison/ Relational, Assignment, Logical, Bitwise, Membership, Identity operators, Python Operator Precedence<br>• Control Flow:<br>• Conditional Statements (if, if ... else, nested if)<br>• Looping in python (while loop, for loop, nested loops)<br>• Conclusion of Unit |
| 3. | **Data Structures, Python Functions and Packages** |
| | • Introduction to Unit<br>• Lists, Tuple, Sets, Dictionaries<br>• String and Slicing<br>• Use of Python built<br>• User defined functions and its types<br>• Command-line Arguments<br>• Using standard packages (e.g. math, scipy, Numpy, pandas etc.)<br>• Conclusion of Unit |

| | |
|---|---|
| **4.** | **Object Oriented Programming** |
| | • Introduction of Unit<br>• Creating Classes and Objects<br>• Inheritance<br>• Method Overloading and Overriding<br>• Data Hiding<br>• Types of Methods : Instance Methods , Static Methods , Class Methods<br>• Accessing attributes , Built-In Class Attributes<br>• Conclusion of Unit |
| **5.** | **File I/O Handling andException Handling** |
| | • Introduction of Unit<br>• Types of File<br>• File Objects, File Built-in Function, File Built-in Methods<br>• File Built-in Attributes<br>• Read/write operations Reading Text<br>• Errors in Python : Compile-Time Errors ,Runtime Errors , Logical Errors<br>• try….except…else, try-finally clause<br>• Regular expressions<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL:**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Core Python Programming | Chun, JWesley | 2007 | Pearson, |
| 2. | Head First Python | Barry,Paul | 2010 | ORielly, |
| **Reference Book** | | | | |
| 1 | Learning Python | Lutz, Mark | O Rielly, 2009 | |
| **Online Resources** | | | | |
| 1 | https://www.learnpython.org/ | | | |
| 2 | https://realpython.com/start-here/ | | | |
| 3 | https://www.programiz.com/python-programming | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **1** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **2** | **3** | **3** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **3** | **2** | **2** | **3** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **2** | **1** | **1** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **3** | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 1 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXCCE2201 | PYTHON PROGRAMMING LAB | 1 Credit [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOMES**

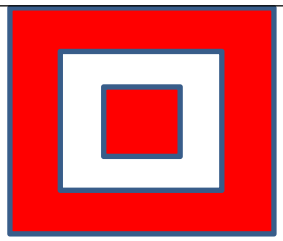
The student will be able to:

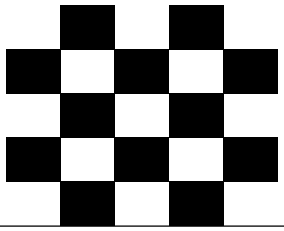
- Understand why Python is a useful scripting language for developers.
- Identify the key issues in Python code, develop and experiment with python programming.
- Develop problem solving and critical thinking skills in fundamental enable techniques like conditionals and loops.
- Construct and explain with structure and concept of different data type like, List and Dictionary.
- Implement read and write data from/to files in Python Develop Python programs step-wise by defining functions with tinker.

**A. List of Programs:**

| Part A | |
|---|---|
| | 1. Write and run a Python program that outputs the value of each of the following expressions:<br>5.0/9.0<br>5.0/9<br>5/9.0<br>5/9<br>9.0/5.0<br>9.0/5<br>9/5.0<br>9/5<br>Based on your results, what is the rule for arithmetic operators when integers and floating point numbers are used?<br>2. Write and run a Python program that asks the user for a temperature in Celsius and converts and outputs the temperature in Fahrenheit. (Use the formula given in the example above and solve for tempFin terms of tempC.)<br>3. Here is an algorithm to print out n! (n factorial) from 0! to 19!:<br>1. Set f = 1<br>2. Set n = 0<br>3. Repeat the following 20 times:<br>a. Output n, "! = ", f<br>b. Add 1 to n<br>c. Multiply f by n<br>Using a for loop, write and run a Python program for this algorithm.<br>4. Modify the program above using a while loop so it prints out all of the factorial values that are less than 1 billion.<br>5. Modify the first program so it finds the minimum in the array instead of the maximum.<br>6. (Harder) Modify the first program so that it finds the **index** of the maximum in the array rather than the maximum itself. |
| **Part B** | |
| | 7. Modify the bubble sort program so it implements the improvements discussed in class. (HINT: To exit the main loop if the array is already sorted, simply change the loop variable to equal the last value so the loop ends early.)<br>8. Draw the Target symbol (a set of concentric Squares, alternating red and white) in a graphics window that is 200 pixels wide by 200 pixels high. Hint: Draw the largest circle first in red, then draw the next smaller circle in white, then draw the next smaller circle in red. Graphical objects drawn later appear "on top of" graphical objects drawn earlier. |

| | |
|---|---|
| | 9. Try entering the following literal values at the prompt. (Hit ENTER after each)<br>**-5**<br>**-4.2**<br>**4.5**<br>**4.14**<br>**0.90**<br>Something odd should occur. *Describe it on paper.*<br>10. Create a 5 X 5 rectangle whose top left corner is at (*row**5, *col**5). (Where is the bottom right corner?) If the sum of the *row* and *col* numbers is even, set the fill color of the rectangle to white, otherwise set it to black. Then draw the rectangle. |





**B. RECOMMENDED STUDY MATERIAL:**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Core Python Programming | Chun, JWesley | 2007 | Pear son, |
| 2. | Head First Python | Barry,Paul | 2010 | ORielly, |
| **Reference Book** | | | | |
| 1 | Learning Python Lutz, Mark O Rielly, 2009 | | | |
| **Online Resources** | | | | |
| 1 | https://www.learnpython.org/ | | | |
| 2 | https://realpython.com/start-here/ | | | |
| 3 | https://www.programiz.com/python-programming | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| CO2 | 2 | 3 | 3 | 1 | - | - | 2 | - | - | - | - | - |
| CO3 | 3 | 2 | 2 | 3 | - | - | 2 | - | - | - | - | - |
| CO4 | 2 | 1 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| CO5 | 3 | 1 | 2 | 1 | - | - | 2 | - | - | - | - | - |

**A. MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | **3** |
| **CO2** | 2 | - | **3** |
| **CO3** | 3 | - | **3** |
| **CO4** | 2 | - | **3** |
| **CO5** | 1 | - | **3** |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXECE2111 | Introduction to Artificial Intelligence | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Analyze various agents in AI
- Apply Search techniques to solve problem
- Solve the Constraint Satisfaction Problems using AI methods
- Implement Adversarial Search in Game Playing
- Solve real world problems using AI techniques

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Artificial Intelligence** | **07** |
| 2. | **Problem solving by Search** | **08** |
| 3. | **Constraint Satisfaction Problems** | **07** |
| 4. | **Software Agents** | **07** |
| 5. | **AI applications** | **07** |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Artificial Intelligence** |
| | • Introduction to Artificial Intelligence<br>• Definition of Artificial Intelligence<br>• A brief history of Artificial Intelligence<br>• Why do we study AI?<br>• What is AI?<br>• Views of AI: Acting Humanly, Thinking Humanly, Thinking Rationally and Acting Rationally<br>• Areas of AI<br>• Agents and environments<br>• PEAS (Performance measure, Environment, Actuators, Sensors)<br>• Environment types<br>• Agent types: Simple reflex agents, Model-based reflex agents, Goal-based agents and Utility-based agents<br>• Examples of Agent<br>• Conclusion of the Unit |
| 2. | **Problem solving by Search** |
| | • Introduction of Unit<br>• Problem-solving agents<br>• Problem formulation<br>• Example problems: 8-Puzzle problem and 8-queens problem<br>• Basic search algorithms<br>• Un-informed search strategies: Breadth-first search, Depth-first search, Depth-limited search, Uniform-cost search and Iterative deepening search<br>• Informed Search Algorithms: Best-first search, Greedy best-first search, A* search, Hill-climbing search, and Genetic algorithms<br>• Conclusion of the Unit |
| 3. | **Constraint Satisfaction Problems** |
| | • Introduction to Constraint Satisfaction Problems (CSP)<br>• Why do we need to consider CSPs?<br>• Constraint Propagation<br>• CSP Vs Search problems<br>• Real-world CSPs<br>• Finite vs. Infinite CSP<br>• CSP as a Search Problem : Backtracking search for CSPs, Forward checking for CSPs and Local search for CSPs |

| | |
|---|---|
| | • Conclusion of the Unit |
| **4.** | **Adversarial Search and Game Playing** |
| | • Introduction to Adversarial Search and Game Playing<br>• Games: Definition, Search vs. Games and Game Tree<br>• Optimal decisions in Games: Mini max algorithm and α-β pruning with example<br>• Imperfect, real-time decisions<br>• Partially Observable Games<br>• State-of-the-Art Game Programs: Chess on Deep Blue, Chess on standard PCs, Checkers on Chinook and Backgammon: TD-Gammon<br>• Conclusion of the Unit |
| **5.** | **AI Applications** |
| | • Introduction of Unit<br>• Language Models<br>• Information Retrieval, Extraction<br>• Natural Language Processing<br>• Machine Translation<br>• Speech Recognition<br>• Expert system: Introduction, phases, architecture, Expert system Vs Traditional system<br>• Robot, Hardware , Planning, Moving<br>• Conclusion of the Unit |

**C. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Artificial Intelligence: A Modern Approach | S. Russell and P. Norvig | Third Edition | Prentice Hall |
| 2. | Prolog: Programming for Artificial Intelligence | I. Bratko | Fourth edition | Addison-Wesley Educational Publishers Inc |
| **Reference Book** | | | | |
| 1. | Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, M. Tim Jones. | | | |
| 2. | The Quest for Artificial Intelligence, Cambridge University Press, Nils J. Nilsson. | | | |
| 3. | Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, William F. Clocksin and Christopher S. Mellish. | | | |
| 4. | Multi Agent Systems, Second Edition, MIT Press, Gerhard Weiss. | | | |
| 5. | Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, David L. Poole and Alan K. Mackworth. | | | |
| **Online Resources** | | | | |
| 1. | https://onlinecourses.nptel.ac.in/noc21_ge20/preview | | | |
| 2. | https://www.coursera.org/learn/introduction-to-ai | | | |
| 3. | https://www.javatpoint.com/artificial-intelligence-tutorial | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **1** | **2** | **2** | **-** | | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **2** | **3** | **3** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **3** | **2** | **2** | **3** | **2** | **-** | | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **2** | **1** | **1** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **3** | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 1 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXECE2112 | INTRODUCTION TO CYBER SECURITY | 3 Credit [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Know basic concepts and importance of information security and cryptography.
- Recognize the business need for information security.
- Gain knowledge about advance cryptographic algorithms and Identify security issues and objectives in computer systems and networks.
- Learn about cryptographic key management.
- Know how message digests are used in authentication.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Introduction to Information Security** | 8 |
| 2 | **The Need for IT Security – I** | 8 |
| 3 | **Advance Algorithms and Techniques** | 8 |
| 4 | **Key Management** | 8 |
| 5 | **Cryptography in User Authentication** | 7 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Information Security** |
| | • Introduction of Unit<br>• Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System<br>• Overview of Cryptography (What is Cryptography, Principles of Cryptography Techniques)<br>• Understanding Mono-Alphabet Substitution Cryptographic Algorithms (Caesar Cipher, Stream Cipher)<br>• Understanding Multi-Alphabet Substitution Cryptographic Algorithms (Simple substitution, Polyalphabetic substitution)<br>• Conclusion of the Unit |
| 2. | **The Need for IT Security – I** |
| | • Introduction of Unit<br>• Business Needs-Protecting the functionality<br>• Enabling the safe operations<br>• Protecting the data, safe guarding the technology assets<br>• Conclusion of the Unit |
| 3. | **Advance Algorithms and Techniques** |
| | • Introduction of Unit<br>• Understanding Birthday Attack (What is Birthday Paradox, how to avoid it)<br>• Asymmetric Key Algorithms and types (RSA, Diffie-Hellman key exchange, DSA)<br>• Conclusion of the Unit Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering<br>• Conclusion of the Unit |
| 4. | **Key Management** |
| | • Introduction of Unit<br>• The basic functions involved in key management including creation<br>• Distribution, verification, revocation and destruction,<br>• Storage, recovery and life span and how these functions affect cryptographic integrity<br>• Conclusion of the Unit |
| 5. | **Cryptography in User Authentication** |
| | • Introduction of Unit<br>• Basics of authentication, tokens,<br>• Certificate-based and biometric authentication,<br>• Extensible authentication protocols, and message digest, Security handshake |

| | |
|---|---|
| | • Conclusion of the Unit |

**C. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Publication |
|---|---|---|---|
| 1 | Cryptography and Network Security | Atul Kahate | McGraw Hill India, 2017 |
| 2 | Cryptography and Network Security | S. Bose | Pearson India , 2016 |
| 3 | Information security: Principles and Practice | Mark Stamp | John Wiley & Sons, Inc., 2011 |

| Reference Book | |
|---|---|
| 1. | Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education |
| 2. | Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson |
| 3 | Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall. |
| **Online Resources** | |
| 1. | https://www.sans.org/cyber-security-courses/introduction-cyber-security/ |
| 2. | https://nptel.ac.in/courses/106106129 |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **1** | **2** | **-** | **2** | | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **2** | **3** | **3** | **1** | **2** | **-** | | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **3** | **2** | **2** | **3** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **2** | **1** | **1** | **2** | **-** | **2** | | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **3** | **1** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **-** |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 1 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXECE2113 | INTRODUCTION TO CLOUD | 3 Credits [3-0-0] |
|---|---|---|

**COURSE OUTCOME:**

Students will be able to:

- Explain the core concepts of the cloud computing paradigm
- Learn the underlying principles of Cloud Technology and various types of cloud Computing architecture and types.
- Learn to evaluate between different cloud solutions offered by various providers based on their merits and demerits.
- Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

**A. OUTLINF OF THE COURSE**

| Unit | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Introduction** | 7 |
| 2 | **Cloud Computing Companies and Migrating to Cloud** | 8 |
| 3 | **Cloud Cost Management and Selection of Cloud Provider** | 8 |
| 4 | **Governance in the Cloud** | 8 |
| 5 | **Ten cloud do's and do not's** | 8 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction** |
| | • Introduction to Unit<br>• Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private and Public clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, Practical applications of cloud computing, Cloud computing delivery models and services (IaaS, PaaS, SaaS)<br>• Obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges,<br>• Practical applications of cloud computing<br>• Conclusion of the Unit |
| **2.** | **Cloud Computing Companies and Migrating to Cloud** |
| | • Introduction to Unit<br>• Web-based business services, Delivering Business Processes from the Cloud: Business process examples,<br>• Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud<br>• Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies<br>• Conclusion of the Unit |
| **3.** | **Cloud Cost Management and Selection of Cloud Provider** |
| | • Introduction to Unit<br>• Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, selecting the right scalable application.<br>• Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration<br>• Conclusion of the Unit |
| 4. | **Governance in the Cloud** |

| | |
|---|---|
| | • Introduction to Unit<br>• Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing<br>• Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration<br>• Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations<br>• Conclusion of the Unit |
| 5 | **Ten cloud do's and do not's** |
| | • Introduction to Unit<br>• Don't be reactive<br>• do consider the cloud a financial issue<br>• don't go alone<br>• do think about your architecture<br>• don't neglect governance<br>• don't forget about business purpose<br>• do make security the centerpiece of your strategy<br>• don't apply the cloud to everything don't forget about Service Management<br>• do start with a pilot project<br>• Conclusion of the Unit |

**C. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Text / Reference Book | Author | Publication |
|---|---|---|---|
| 1 | Cloud Computing: Principles and Paradigms | Rajkumar Buyya, James Broberg, Andrzej M. Goscinski | John Wiley and Sons Publications, 2011 |
| 2 | Brief Guide to Cloud Computing | Christopher Barnett | Constable & Robinson Limited, 2010 |
| 3 | Handbook on Cloud Computing | Borivoje Furht, Armando Escalante, Springer | 2010 |
| 4 | Cloud Computing Theory and Practice | Dan C Marinescu, Elsevier | 2013 |
| 5 | Cloud Computing for Dummies | Judith Hurwitz, Robin Bloor, Marcia Kaufman & Fern Halper | Wiley Publishing, 2010 |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | - | 2 | - | - | - | - | - | - |
| **CO2** | 2 | 3 | 2 | 1 | 2 | - | - | - | - | - | - | - |
| **CO3** | 3 | 1 | 2 | 3 | - | - | 2 | - | - | - | - | - |
| **CO4** | 2 | 1 | 3 | 2 | - | - | 2 | - | - | - | - | - |
| **CO5** | 3 | 1 | 2 | 1 | - | - | 2 | - | - | - | - | - |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 3 | - | - |
| **CO2** | 1 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 2 | - | - |
| **CO5** | 2 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXECE2114 | Introduction to Game Technology | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Student will able to

- Comprehend the critical importance of Game Technology
- Use learned skills to solve problems of various layouts
- Recognize what is the role each hardware component of a PC plays in games and in making games
- Conduct independent work in entertainment software engineering context.
- Work as a productive member and as part of a team developing larger entertainment software product.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Gaming Technology** | **07** |
| 2. | **History of Gaming Hardware** | **08** |
| 3. | **Input devices** | **08** |
| 4. | **Functions of a GPU in games** | **07** |
| 5. | **Role of a CPU in games** | **07** |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Gaming Technology** |
| | • Introduction of Unit<br>• Basics of processes and models applied in the entertainment software industry<br>• Basics of the game development tools<br>• Introduction to game engines and their functions<br>• Basics of 3D objects<br>• Introduction to game development-related programming problem.<br>• Basics of artificial intelligence in entertainment software engineering context.<br>• Basics of sound engineering<br>• Gamification and Serious games<br>• Basic principles of AR and VR development<br>• Conclusion of unit |
| 2. | **History of Gaming Hardware** |
| | • Introduction of Unit<br>• Console architecture over the decades<br>• Evolution of input devices in games along with their design changes<br>• analysis of hardware generations of consoles - with a brief overview of Gen 1-4 devices a<br>• A broader look at some significant consoles of Gen 5-8<br>• Conclusion of Unit |

| | |
|---|---|
| **3.** | **Input devices** |
| | • Introduction of Unit<br>• Types and variations of input devices (touch devices, controllers, keyboards, and mice)<br>• How these devices work<br>• Taking multiple types of inputs from these devices<br>• Working on input<br>• Adding support for these devices in your games –<br>• challenges of building/designing an input device (ergonomics, abstraction vs immersion)<br>• Conclusion of Unit |
| **4.** | **Functions of a GPU in games** |
| | • Introduction of Unit<br>• Introduction to graphics APIs<br>• commonly used APIs<br>• Working of APIs in GPU Programming)<br>• Shaders<br>• Lighting Techniques (Ray tracing, ray-casting)<br>• Difference between an API and an SDK<br>• Conclusion of Unit |
| **5.** | **Role of a CPU in games** |
| | • Introduction of Unit<br>• multi-threading<br>• hyper-threading,<br>• multi-core CPUs<br>• parallel processing –<br>• Need of multi-threading in games<br>• Function of CPU in games<br>• collision detection<br>• pathfinding,<br>• Realtime object tracking<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL**

| **S. No** | **Text Books:** | **Author** | **Edition** | **Publication** |
|---|---|---|---|---|
| 1. | Advanced Game Development with Programmable Graphics Hardware | Alan Watt, Fabio Policarpo | April 2005 | A K Peters Ltd |
| 2. | Unity 5 Game Optimization | Chris Dickinson | Nov 2015 | O' Riley Media |
| **Reference Book** | | | | |
| 1. | Evan Amos, 'The Game Console: A Photographic History from Atari to Xbox', No Starch Press, November 2018, ISBN 978-1593277437 | | | |
| **Online Resources** | | | | |
| 2. | https://www.edx.org/learn/game-development tps://learnui.design/ | | | |
| 3. | https://files.eric.ed.gov/fulltext/EJ1090277.pdf | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| **CO2** | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | 3 | - | 2 | - | - | - | - | - | - |
| **CO4** | 2 | 1 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| **CO5** | 3 | 1 | 2 | 1 | - | - | 2 | - | - | - | - | - |

**B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 2 | - | - |
| **CO2** | 2 | - | - |
| **CO3** | 3 | - | - |
| **CO4** | 3 | - | - |
| **CO5** | 1 | - | - |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXECE2115 | Digital Electronics | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**Course Outcomes: -**

Students will be able to:

- Verify and interpret truth tables for all logic gates.
- Design of decoders and multiplexer.
- Use various flip-flops in digital circuits
- Apply registers and counters in digital circuits.
- Do conversion from A/D and D/A convertors.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Number System and Logic Gates | 7 |
| 2. | Decoders, Multiplexers & De-Multiplexers | 6 |
| 3. | Flip-Flops | 7 |
| 4. | Registers And Counters | 8 |
| 5. | Memories And Converters | 8 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Number System and Logic Gates** |
| | • Introduction to number systems – Binary to decimal conversion – Decimal to binary conversion –Octal numbers – Hexadecimal numbers<br>• Logic gates – NOT, OR, AND – Universal NAND and NOR gates – EX-OR and EX-NOR gates – DeMorgan's Theorems — 1's complement – 2's complement – Adders (half & full) – Subtractor (half & full).<br>• Conclusion of the Unit |
| 2. | **Decoders, Multiplexers & De-Multiplexers** |
| | • Introduction of Unit<br>• Basic functions and block diagram of Encoders and decoders.<br>• Basic functions and block diagram of Multiplexers and De-Multiplexers, Different types and ICs.<br>• 4 bit decoder circuits for 7 segment display and other applications.<br>• Conclusion of the Unit. |
| 3. | **Flip-Flops** |
| | • Introduction of Unit<br>• J-K Flip-Flop<br>• R-S Flip-Flop<br>• D-Type Flip-Flop<br>• T-Type Flip-Flop<br>• Applications of Flip-Flops<br>• Conclusion of the Unit |
| 4. | **Registers And Counters** |
| | • Introduction to Shift Register<br>• Introduction and basic concepts including shift left and shift right.<br>• Serial in parallel out, serial in serial out, parallel in serial out, parallel in<br>• parallel out.<br>• Introduction to Counters (Asynchronous and Synchronous counters )<br>• Binary up/down counters (upto MOD-8)<br>• Ring counter with timing diagram<br>• Conclusion of the Unit |
| 5. | **Memories And Converters** |

| | |
|---|---|
| | • Introduction of Unit<br>• Memories – ROM, RAM, EPROM, EEPROM – Volatile and non-volatile – Static and dynamic RAM.<br>• Analog to digital converters – Parallel Comparator A/D converter – Dual slope converter –Successive approximation method – Counter type converter.<br>• Digital to analog converters – Binary weighted D/A converter – R/2R ladder network converter<br>• Conclusion of the Unit |

## C. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Digital Principles and Applications | Donald P Leach, Malvino | - | McGraw Hill |
| 2. | Modern Digital Electronics | RP Jain | - | Tata McGraw Hill |
| 3. | Digital Fundamentals | Floyd and Jain | - | Pearsons Education |
| **Reference Book** | | | | |
| 3. | Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi | | | |
| 4. | Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi | | | |
| **Online Resources** | | | | |
| 3. | https://archive.nptel.ac.in/courses/108/105/108105132/ | | | |
| 4. | https://onlinecourses.nptel.ac.in/noc22_ee55/preview | | | |

**MAPPING OF CO VS PO/PSO**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **3** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **3** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **2** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: BTXEME2116 | ENGINEERING MECHANICS | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

The student will be able to:

CO1 Analyze the forces act on a component and method of resolution.
CO2 Evaluate centroid and center of gravity of an object and also analyze how to minimize the effort for lifting a load.
CO3 Evaluate the effect of friction and also evaluate forces with the effect of friction.
CO4 Analyze the conversion of linear motion into angular motion and vice versa.
CO5 Analyze the effect of impact on elastic and non-elastic body.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Fundamentals of Mechanics** | **8** |
| 2. | **Machine & Moment of Inertia** | **8** |
| 3. | **Friction & Belt Drive** | **7** |
| 4. | **Dynamics of Particles** | **8** |
| 5. | **Work, Power & Impact** | **8** |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Fundamentals of Mechanics** |
| | • Introduction of Unit<br>• Fundamental laws of mechanics, Principle of transmissibility.<br>• System of forces, Resultant force, Resolution of force.<br>• Moment and Couples, Varignon's Theorem,<br>• Equilibrium, Conditions for equilibrium, Lami's theorem.<br>• Conclusion of Unit |
| **2.** | **Machine & Moment of Inertia** |
| | • Introduction of Unit<br>• Lifting Machines: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines – System of Pulleys.<br>• Centroid & Moment of Inertia: Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section- I, L, C and H.<br>• Conclusion of Unit |
| **3.** | **Friction & Belt Drive** |
| | • Introduction of Unit<br>• Friction: Types of Friction, Laws of friction, Angle of friction, Angle of repose, Numericals on Ladder.<br>• Belt Drive: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Length of belt, Ratio of tensions and power transmission by flat belt drives.<br>• Conclusion of Unit |
| **4.** | **Dynamics of Particles** |
| | • Introduction of Unit<br>• Kinematics of Particles and Rigid Bodies: Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular acceleration.<br>• Kinetics of Particles and Rigid Bodies: Newton's laws, Linear Momentum, Equation of motion in rectangular coordinate, Equation of motion in plane for a rigid body, D' Alembert principle.<br>• Conclusion of Unit |
| **5.** | **Work, Power & Impact** |
| | • Introduction of Unit<br>• Work, Energy and Power: Work of a force, weight, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy.<br>• Impact: Collision of elastic bodies, types of impact, conservation of momentum, Newton's law of collision.<br>• Conclusion of Unit |

## C. RECOMMENDED STUDY MATERIAL

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Vector Mechanics for Engineers | Beer and Johnston | Latest | Tata McGraw Hill |
| 2. | Engineering Mechanics | D S Kumar | Latest | S K Kataria& Sons |
| 3. | Engineering Mechanics Statics | Meriam, J. L. & Kraige, L. G | Latest | John Wiley & Son |
| 4. | Engineering Mechanics | S. Ramamruthan | Latest | Dhanpat Rai Pub. |
| 5. | Engineering Mechanics | Shames | Latest | Pearson Education |
| **Important Web Links** | | | | |
| 1. | https://nptel.ac.in/courses/112103109/ | | | |
| 2 | https://nptel.ac.in/courses/112106286/ | | | |
| 3. | https://freevideolectures.com/course/2264/engineering-mechanics | | | |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | – | – | – | – | – | – | – | – |
| **CO2** | 2 | 3 | 1 | 2 | – | – | – | – | – | – | – | – |
| **CO3** | 3 | 2 | 2 | 2 | – | – | – | – | – | – | – | – |
| **CO4** | 3 | 3 | 1 | 2 | – | – | – | – | – | – | – | – |
| **CO5** | 3 | 3 | 2 | 2 | – | – | – | – | – | – | – | – |

**MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES**

| | PSO1 | PSO2 | PSO3 |
|---|---|---|---|
| **CO1** | 1 | — | 3 |
| **CO2** | 2 | — | 3 |
| **CO3** | 1 | — | 3 |
| **CO4** | 1 | — | 3 |
| **CO5** | 2 | — | 3 |

| Code:BUACHU2204 | Language Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOMES:**

The students would be able to

CO 1: Identify common errors in spoken and written communication.
CO 2: Get familiarized with English vocabulary and language proficiency.
CO 3: Improve nature and style of sensible writing, acquire employment and workplace communication skills.
CO 4: Improve their Technical Communication Skills through Technical Reading and Writing practices.
CO 5: Perform well in campus recruitment, engineering and all other general competitive examinations.

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Everyday Conversations | 8 |
| 2. | Asking for | 7 |
| 3. | Reporting/ Describing | 7 |
| 4. | Meeting People | 7 |
| 5. | Expressing & Talking about | 7 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1 | **Everyday Conversations** |
| | • Introduction to the Unit<br>• Introducing self / others<br>• Weather<br>• Classroom<br>• Asking about facilities around<br>• Describing a person / thing<br>• Points to cover: Vocabulary, grammar, Construction of sentences, listening<br>• Methodology: Role plays, Videos, Classroom conversation, worksheets<br>• Conclusion & Real Life Application |
| 2 | **Asking for** |
| | • Introduction to the Unit<br>• Help/ Suggestion/ ideas<br>• Clarification/ Directions<br>• Time/ food<br>• Advice<br>• Uses<br>• Points to cover: Vocabulary, grammar, Construction of sentences, listening<br>• Methodology: Role plays, Videos, Classroom conversation, worksheets<br>• Conclusion & Real-Life Application |
| 3 | **Reporting/ Describing** |
| | • Introduction to the Unit<br>• Incidences<br>• Personalities<br>• Experiences<br>• Wants/Needs<br>• Intentions<br>• Points to cover: Vocabulary, grammar, Construction of sentences, listening<br>• Methodology: Role plays, Videos, Classroom conversation, worksheets<br>• Conclusion & Real-Life Application |
| 4 | **Meeting People** |

| | |
|---|---|
| | • Introduction to the Unit<br>• Greetings<br>• Starting the Conversation<br>• Small talks<br>• Closing the conversation<br>• Points to cover: Vocabulary, Grammar, Construction of sentences, listening<br>• Methodology: Role plays, Videos, Classroom conversation, worksheet<br>• Conclusion & Real-Life Application |
| **5** | **Expressing & Talking about** |
| | • Introduction to the Unit<br>• Happiness/Displeasure<br>• Preferences<br>• Doubts<br>• Views<br>• Unawareness<br>• Points to cover: Vocabulary, grammar, Construction of sentences, listening<br>• Methodology: Role plays, Videos, Classroom conversation, worksheets Interests<br>• Different Cultures, Clothes, cars, institutes, situations<br>• Schedules, prices<br>• Points to cover: Vocabulary, grammar, Construction of sentences, listening Methodology: Role plays, Videos, Classroom conversation, worksheets<br>• Conclusion & Real-Life Application |

C: **Recommanded Study Material**

| Sr. No | Reference Book | Author | Publication |
|---|---|---|---|
| 1. | Speak Now Level I & II | Jack C Richards & David Bohlke | Oxford Press |
| 2. | Business Benchmark, Level – | Guy Brook-Hart | Upper Intermediate by Cambridge University Press |
| 3. | Practical English Usage | Michel Swan | Oxford University Press |
| 4. | Cambridge Grammar for English: A comprehensive Guide for spoken & written English | Ronald Carter, Michael McCarthy | (South Asian edition), Cambridge University Press |

| Code:BULCSE2201 | Skill Enhancement Generic Course-II | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOMES: On completion of the course a student will be able to:**

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

| LIST OF ACTIVITIES | |
|---|---|
| 1 | Types of Interviews, Interview Practice |
| 2 | Time & Work, Syllogisms |
| 3 | Critical Reasoning |
| 4 | Mensuration, Cubes & Dices |
| 5 | Para Jumble, Permutations & Combinations |
| 6 | Blood Relations & Direction Sense, Manners & Etiquette |
| 7 | Idiom & Phrases, Prefix-Suffix |
| 8 | Probability. Puzzles |
| 9 | Data Sufficiency, Logical Choices & Connectives |
| 10 | Date Interpretations, Deductions |
| 11 | Essay Writing, E-mail Writing |
| 12 | Personal Grooming |

| Code:BUVCPH2102 | Health Behavior in Communication | 2 Credits [LTP: 2-0-0] |
|---|---|---|

**COURSE OUTCOME**

The student would be able to:

CO1: Demonstrate an understanding of behavior change theories that are often used in health contexts.
CO2: Effectively evaluate existing health communication campaigns that use behavior change theories
CO3: Evaluation of health communication campaigns.
CO4: Understand how to use behavior change theories in the construction and
CO5: Develop and enhance research skills and critical thinking.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Behavior Change** | **04** |
| 2 | **Social Marketing, Cognitive Theory, and Norms** | **05** |
| 3 | **Integrated Models of Health Communication & Behavior Change** | **05** |
| 4 | **Digital Health Communication** | **05** |
| 5 | **Health Communication and Social Responsibility** | **05** |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1** | **Behavior Change** |
| | • Introduction of the Unit<br>• Introduction to Course, Health Communication and Behavior Change<br>• Introduction to Behavior Change Theories<br>• Upstream/Downstream Behavior Change and Social Determinants of Health<br>• Conclusion of the unit |
| **2** | **Social Marketing, Cognitive Theory, and Norms** |
| | • Introduction of the Unit<br>• Social Marketing<br>• Social Cognitive Theory<br>• Social Norms<br>• Conclusion of the unit |
| **3** | **Integrated Models of Health Communication & Behavior Change** |
| | • Introduction of the Unit<br>• Integrated Model of Behavioral Prediction<br>• Stages of Change<br>• Health Belief Model<br>• Conclusion of the unit |
| **4** | **Digital Health Communication** |
| | • Introduction of the Unit<br>• eHealth<br>• mHealth<br>• Social Media and Health Communication<br>• Conclusion of the unit |
| **5** | **Health Communication and Social Responsibility** |
| | • Introduction of the Unit<br>• Health, Cause Marketing, and Corporate Social Responsibility<br>• Entertainment Media and Health<br>• Unintended Effects of Health Messages |

| | |
|---|---|
| | Conclusion of the unit |

**C. RECOMMENDED STUDY MATERIAL**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | The role of theory in developing effective health communications, | Fishbein, M. & Capella, J.N. | 2006 | Journal of Communication, S1-S17.<br>Dhanpat Rai |
| 2 | The effectiveness of social marketing interventions for health improvement: What's the evidence? | Gordon, R., McDermott, L., Stead, M., Angus, K. | 2006 | Public Health, 1133-1139. |
| 3 | Using the Integrative Model to explain how exposure to sexual media content influences adolescent sexual behavior. | Bleakley, A., Hennessy, M., Fishbein, M & Jordan, A. | 2011 Latest | Health Education & Behavior, 530-540. |
| 4 | New directions in eHealth communication: Opportunities & challenges. | Kreps, G.L. & Neuhauser, L. | 2010 | Patient Education and Counseling, 329-336. |
| 5 | To do well by doing good: Improving corporate image through cause-related marketing. | Vanhamme, J., Lindgreen, A., Reast, J., van Popering, N. | 2012 | Journal of Business Ethics, 259-274 |

t

**Code :BCECCE3101 Introduction to Web Technology 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Create an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Apply HTML & CSS to solve real time web problems.

### A. CO-PO Mapping

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

### B. CO-PSO Mapping

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to HTML And Internet** | 8 |
| 2. | **HTML& CSS** | 8 |
| 3. | **HTML5, CSS3** | 8 |
| 4. | **XML** | 6 |
| 5. | **Practical Website Development** | 6 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to HTML And Internet** |
| | • Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP,TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture<br>• Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development.<br>• HTML, CSS, JS, XML; HTTP, secure HTTP, etc; URL, Web Services – SOAP, REST<br>• Conclusion of the Unit |
| 2. | **HTML & CSS** |
| | • Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag;<br>• More HTML Tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button, Images.<br>• Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Inline styles, External and Internal Style Sheets, Borders & boxing<br>• Conclusion of the Unit |
| 3. | **HTML5, CSS3** |
| | • Introduction to HTML5.<br>• Introduction to CSS3, New features, Local storage, Web Sockets, Server events, Canvas,<br>• Audio & Video, Geo location, Micro data, Drag and Drop. Browser life cycle and browser rendering stages. Service workers<br>• Conclusion of the Unit |
| 4. | **XML** |
| | • Introduction to XML<br>• Difference b/w Html & XML, XML editors.<br>• XML Elements & Attributes XML DTD.<br>• XML Schema, XML Parser.<br>• Document Object Model (DOM), XML DOM.<br>• Conclusion of the Unit |
| 5. | **Practical web site development** |
| | • Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures,<br>• Web authoring tools, Web hosting, website maintenance, generating traffic to your website.<br>• Conclusion of the Unit |

## C. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Practical Web Design for Absolute Beginners | AdrianW. West | 2016 | Apress 2016 |
| 2. | Introducing Web Development | Jorg Krause | 2017 | Apress 2017 |
| **Reference Book** | | | | |
| 3. | HTML and CSS: Design and Build Websites – by Jon Duckett | | | |
| 4. | Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages – by Elisabeth Robson & Eric Freeman Publisher- ORELLY | | | |
| **Online Resources** | | | | |
| 6. | https://www.w3schools.com/html/html_links.asp | | | |

**Code: BCECCE3102** **DATA STRUCTURE AND ALGORITHMS** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyse running times of algorithms using asymptotic analysis.
- Analyse time complexities of various searching, sorting.
- Create various applications using stack, queue, tree and graph.
- Able to select relevant data structure to solve the problem.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Data structures** | **8** |
| **2.** | **Searching and Sorting** | **8** |
| **3.** | **Stack and Queue** | **8** |
| **4.** | **Linked List** | **9** |
| **5.** | **Tree Graphs and their Applications** | **7** |

**D. Detailed Syllabus**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Data structures** |
| | • Introduction to Unit<br>• Definition,<br>• Classification of data structures: primitive and non-primitive<br>• Elementary data organization<br>• Time and space complexity of an algorithm (Examples), String processing.<br>• Definition of dynamic memory allocation<br>• Accessing the address of a variable<br>• Declaring and initializing pointers -<br>• Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc().<br>• Recursion – Definition, advantages, Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.<br>• Conclusion and Real Life Applications of unit |
| **2.** | **Searching and Sorting** |
| | • Introduction to Unit<br>• Basic Search Techniques - Sequential search, Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search.<br>• Sorting: General back ground and definition- Bubblesort,Selectionsort,Insertionsort,Mergesort,Quicksort<br>• Conclusion and Real Life Applications of unit |
| **3.** | **Stack and Queue** |
| | • Introduction to Unit<br>• Stack – Definition<br>• Array representation of stack<br>• Operations on stack: Infix, prefix and postfix notations<br>• Conversion of an arithmetic expression from Infix to postfix<br>• Applications of stacks.<br>• Definition of queue<br>• Array representation of queue<br>• Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue,<br>• Operations on all types of Queues<br>• Conclusion and Real Life Applications of Unit |
| **4.** | **Linked List** |
| | • Introduction of Unit<br>• Definition of linked list<br>• Components of linked list<br>• Representation of linked list<br>• Advantages and Disadvantages of linked list<br>• Types of linked list: Singly linked list, doubly linked list, Circular linked list<br>• Operations on singly linked list: creation, insertion, deletion, search and display<br>• Conclusion and Real Life Applications of Unit |
| **5.** | **Tree Graphs and their Applications** |
| | • Introduction to Unit<br>• Definition : Tree<br>• Binary tree, Complete binary tree, Binary search tree<br>• Heap |

| | |
|---|---|
| | • Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node<br>• Binary tree: Array representation of tree, Creation of binary tree.<br>• Traversal of Binary Tree: Preorder, Inorder and postorder.<br>• Graphs<br>• Application of Graphs<br>• Depth First search, Breadth First search.<br>• Conclusion and Real Life Applications of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Schaum's outline series Data structures | Lips chutz | Latest | TMH. |
| 2. | Data Structures and program designing using 'C' | Robert Kruse | Latest | Pearson Education |
| **Reference Book** | | | | |
| 1. | Introduction to Data Structures in C by- Kamthane Pearson Education2005 | | | |
| 2. | Data Structures Using C by- Bandyo Padhyay Pearson Education | | | |
| **Online Resources** | | | | |
| 1. | https://www.gatevidyalay.com/data-structures/ | | | |
| 2. | https://www.youtube.com/watch?v=QBrDsG3MTkw | | | |
| 3. | https://www.tutorialspoint.com/data_structures_algorithms/index.htm | | | |

**Code: BCECCE3103** **Operating System** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Know structure and organization of the file system.
- Get concept what a process is and how processes are synchronized and scheduled.
- Acquire different approaches to memory management.
- Use system calls for managing processes, memory and the file system.
- Know the data structures and algorithms used to implement an OS.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Operating System Overview** | 08 |
| 2. | **Process Management** | 08 |
| 3. | **Process Deadlocks** | 08 |
| 4. | **Memory Management** | 09 |
| 5. | **File Management** | 07 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Operating System Overview** |
| | • Introduction of Unit<br>• Definition, Two views of operating system, Evolution of operating system, Types of OS.<br>• System Call, Handling System Calls, System Programs, Operating System Structures,<br>• The Shell, Open Source Operating Systems<br>• Conclusion of Unit |
| **2.** | **Process Management** |
| | • Introduction of Unit<br>• Process v/s Program, Multi-programming, Process Model, Process States, Process Control Block.<br>• Threads, Thread v/s Process, User and Kernel Space Threads.<br>• Inter Process Communication, Race Condition, Critical Section<br>• Implementing Mutual Exclusion: Mutual Exclusion with Busy Waiting<br>• Interrupts, Lock Variables, Strict Alteration, Peterson's Solution, Test and Set Lock.<br>• Sleep and Wake-up, Semaphore, Monitors, Message Passing.<br>• Classical IPC problems: Producer Consumer, Sleeping Barber, Dining Philosopher<br>• Problem<br>• Process Scheduling: Goals, Batch System Scheduling (First-Come First-Served, Shortest Job First, Shortest Remaining Time Next), Interactive System Scheduling (Round-Robin Scheduling, Priority Scheduling, Multiple Queues), Overview of Real Time System Scheduling<br>• Conclusion of Unit |
| **3.** | **Process Deadlocks** |
| | • Introduction of Unit<br>• Introduction, Deadlock Characterization, Preempt able and Non-preempt able Resources<br>• Resource – Allocation Graph, Conditions for Deadlock.<br>• Handling Deadlocks: Ostrich Algorithm, Deadlock prevention, Deadlock Avoidance.<br>• Deadlock Detection (For Single and Multiple Resource Instances), Recovery From<br>• Deadlock (Through Preemption and Rollback)<br>• Conclusion of Unit |
| **4.** | **Memory Management** |
| | • Introduction of Unit<br>• Introduction, Mono programming vs. Multi-programming, Modeling Multiprogramming, Multiprogramming with fixed and variable partitions, Relocation and Protection.<br>• Memory management (Bitmaps & Linked-list), Memory Allocation Strategies<br>• Virtual memory: Paging, Page Table, Page Table Structure, Handling Page Faults, TLB's<br>• Page Replacement Algorithms: FIFO, Second Chance, LRU, Optimal, LFU, Clock, WS- Clock, Concept of Locality of Reference, Belady's Anomaly<br>• Segmentation: Need of Segmentation, its Drawbacks, Segmentation with Paging(MULTICS)<br>• Conclusion of Unit |
| **5.** | **File Management** |
| | • Introduction of Unit<br>• File Overview: File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Single Level, two Level and Hierarchical Directory Systems, File System Layout.<br>• Implementing Files: Contiguous allocation, Linked List Allocation, Linked List<br>• Allocation using Table in Memory, Inodes. |

| | |
|---|---|
| | • Directory Operations, Path Names, Directory Implementation, Shared Files<br>• Free Space Management: Bitmaps, Linked List<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Operating system concepts | Silberschatz, Galvin, Gagne | 8th edition | John Wiley and Sons |
| 2. | Modern Operating System | A.S.Tanenbaum | 2nd Edition | Pearson |
| **Reference Book** | | | | |
| 1. | "Head First Java" by Kathy Sierra | | | |
| **Online Resources** | | | | |
| 1. | https://www.coursera.org/courses?query=operating%20system | | | |
| 2. | https://onecompiler.com/java | | | |

| Code : BCECCE3201 | Web Technology Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**Course Outcome: -**
**Students will be able to:**

- Apply the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Evaluate how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.

A. **LIST OF EXPERIMENTS**

| | |
|---|---|
| **1** | Hello World Web Page<br>(a) Create a web page using basic HTML features like tags, attributes, elements and page title<br>(b)How to install and configure a web server |
| **2** | Create a My Profile Page<br>(a) Using text boxes, check boxes, radio buttons and submit buttons.<br>(b) Design a web page using CSS include the following:<br>1. Control the repetition of image with back ground-repeat property.<br>2. Define style for links asa: link, b:active,c:hover,d:visited.<br>3. Add customized cursors for links. |
| **3** | Create a My Profile Page<br>(a) A more functional web page by making use of headings, paragraphs, lists, images and links.<br>(b) Design a web page using CSS include the following:<br>1. Use different font styles.<br>2. Set back ground image for both the page and single elements on the page. |
| **4** | Create XML Http Request and retrieve data from a text file and an XML file. |
| **5** | Create the following webpage:<br>(a) Show the class time table in a tabular format.<br>(b) Create a web page using HTML to show your geolocation. |
| **6** | Create a webpage using HTML for audio and video player. |
| **7** | Create a log in registration form using PHP. |
| **8** | Develop a PHP web page to manipulating files such as creating ,writing, reading and uploading. |
| **9** | Create a dynamic web page by using PHP conditional operators, loops and strings to create an dynamic time table page. |
| **10** | Develop a PHPweb application track the user as how many times visited and last visited time |
| **11** | Develop a static website–I. |
| **12** | Develop a static website–II. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Practical Web Design for Absolute Beginners | AdrianW. West | 2016 | Apress 2016 |
| 2. | Introducing Web Development | Jorg Krause | 2017 | Apress2017 |
| 3. | HTML & CSS: The Complete Reference | Thomas Powell | 2010, FifthEdition | McGrawHill, |
| **Reference Book** | | | | |
| 1. | HTML and CSS: Design and Build Websites – by Jon Duckett | | | |
| 2. | Head First HTML and CSS: A Learner‘s Guide to Creating Standards-Based Web Pages – by Elisabeth Robson & Eric Freeman Publisher- ORELLY | | | |
| **Online Resources** | | | | |
| 1. | https://www.w3schools.com/html/html_links.asp | | | |
| 2. | https://www.tutorialrepublic.com/html-tutorial/html-links.php | | | |

**Code : BCECCE3202** **Data Structures and Algorithms Lab** **1 Credits [LTP: 0-0-2]**

**COURSE OUTCOME**

Students will be able to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyse running times of algorithms using asymptotic analysis.
- Implement various searching, sorting.
- Create various applications using stack , queue, tree and graph.
- Implement relevant data structure to solve the real world problem.

A. **LIST OF EXPERIMENTS**

| | |
|---|---|
| **1** | Use a recursive function to find<br>a) GCD of two numbers.<br>b) Use a recursive function to find the Fibonacci series.<br>c) Factorial<br>d) Binomial Coefficient |
| **2** | Perform the following:<br>a) Insert an integer into a given position in an array.<br>b) Deleting an integer from an array. |
| **3** | Perform the following:<br>a) Write a program for linear search<br>b) Write a program for Binary search<br>c) Write a program to sort N numbers using bubble sort. |
| **4** | Perform the following:<br>a) Write a program to sort N numbers using insertion sort.<br>b) Write a program to sort N numbers using selection sort.<br>c) Write a program to sort N numbers using bubble sort. |
| **5** | Write a program to sort N numbers using quick sort. |
| **6** | Write a program to sort N numbers using merge sort. |
| **7** | Write a C program to create Stack using array. |
| **8** | Write a C program to create queue using array. |
| **9** | Write a program to create a linked list and to display it. |
| **10** | Inserting a node into a singly linked list on various position beginning, after given location and end. |
| **11** | Deleting a node into a singly linked list on various position beginning, after given location and end. |
| **12** | Write a C program to create stack and queue using linked list. |
| **13** | Creating a binary search tree and traversing it using inorder, preorder and postorder. |
| **14** | Write a C program to implement graph. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Data Structures and Algorithm Analysis in C | Weiss | 2001 | Pearson Education |
| 2. | Schaum's outline series Data structures | Lipschutz | | Tata McGraw-Hill |
| 3. | Data Structures and program designing using 'C' | Robert Kruse | | Pearson |
| 4. | Data Structures Using C | Bandyopadhyay | 1999 | Pearson Education |
| **Reference Book** | | | | |
| 5. | Data Structures Using C, Pearson Education, Tenenbaum. | | | |
| 6. | Introduction to Data Structures in C, Pearson Education 2005, Kamthane | | | |
| 7. | Data Structures using C and C++, Pearson Education, Langsam, Ausenstein Maoshe & M. Tanenbaum Aaron. | | | |
| **Online Resources** | | | | |
| 8. | https://www.programiz.com/dsa | | | |
| 9. | https://www.geeksforgeeks.org/data-structures/ | | | |
| 10. | https://www.codechef.com/certification/data-structures-and-algorithms/prepare | | | |

**Code: BCECCE3203** **Linux Operating System Lab** **1 Credits [LTP: 0-0-2]**

**COURSE OUTCOME**

Students will be able to:

- Implement basic services and functionalities of the operating system using system calls.
- Use modern operating system calls and synchronization libraries in software/ hardware interfaces.
- Know the benefits of thread over process and implement synchronized programs using multi-threading concepts.
- Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
- Implement memory management schemes and page replacement schemes.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1. | Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin d) Priority |
| 2. | Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed c) Linked |
| 3. | Write a C program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue |
| 4. | Write a C program to simulate the MVT and MFT memory management techniques. |
| 5. | Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit |
| 6. | Write a C program to simulate paging technique of memory management |
| 7. | Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance. |
| 8. | Write a C program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN |
| 9. | Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU |
| 10. | Write a C program to simulate page replacement algorithms |
| 11. | Write a C program to simulate producer-consumer problem using semaphores. |
| 12. | Write a C program to simulate the concept of Dining-Philosophers problem. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Operating system concepts | Silberschatz, Galvin, Gagne | 8th edition | John Wiley and Sons |
| 2. | Modern Operating System | A.S.Tanenbaum | Second Edition | Pearson |
| **Reference Book** | | | | |
| 3. | Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016 | | | |
| **Online Resources** | | | | |
| 4. | *https://www.coursera.org › courses › query=operating s...* | | | |
| 5. | *https://www.javatpoint.com › best-courses-for-the-oper...* | | | |
| 6. | *https://hackr.io › tutorials › learn-operating-systems* | | | |

**Code: BCECCE3204** **Office Automation Lab** **1 Credits [LTP: 0-0-2]**

**Course Outcome: -**

Students will be able to:

- Prepare document in MS word using pictures and editing properly.
- Construct forms in MS. Word
- Protect a document from unauthorized access by assigning password
- Prepare worksheet to keep records and how to use mathematical formula in same
- Present a Presentation using MS Power point

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | **MS Word**<br>Prepare a document about any tourist destination of your choice with appropriate pictures and editing features. |
| **2** | Prepare a News Paper Layout. Insert appropriate pictures wherever necessary. Use the following Features:<br>(a) Three Column and Four Column setting<br>(b) Set One or Two Advertisements<br>(c) Use Bullets and Numbering. |
| **3** | Create a Document consisting of Bio-data. It includes<br>(a) A table giving your qualification and /or experience of work. Table should be Bordered and Shaded.<br>(b) A Multilevel list giving your areas of interest and further areas of interest. The sub areas should be numbered as 'a','b', etc while the area should be numbered as '1','2',etc.<br>(c) The information should be divided in ―General‖ and ―Academic‖ sections.<br>The header should contain ―BIO-DATA ‖while the footer should have page numbers in the format Page1of 10.<br>(d) Assign a password for the document to protect it from unauthorized access. |
| **4** | Assume that you are coordinating a seminar in your organization. Write a letter to 10 different IT companies asking them to participate in the seminar using mail merge facility. |
| **5** | Prepare a document which contains template of marks card of students. Assume that there are 10 students. The footer for the document should be 'Poornima University Jaipur'. |
| **6** | Prepare a document about any topic In mathematics which uses mathematical symbols. (At least 5 mathematical symbols should be used). Assign a password for the document to protect it from unauthorized access. Demonstrate the use of Hyperlink Option. Sets margins to your document, a font of size and double spaced document |
| **7** | **MS-Excel**<br>Open a new work book, save it as JavaCoffeeBar.xls. In sheet 1 write following sales data for JavaCoffee bar to show their first 6 months sales.<br>(a) Select cell B4:D4 and change the horizontal alignment to center and text to 90degree.<br>(b) All titles should be in bold<br>(c) Format all cells numbers to currency style and adjust width as necessary.<br>(d) Add border to data. |
| **8** | Prepare a worksheet to maintain student information. The work sheet should Contain Roll Number, Name and marks in 5 subjects. (Max Marks is 100).Validate the marks. Calculate the total marks. Assign the grade according to the following. Assign grade 'A' if the total marks is above 450. From 401 to 449 assign the grade as 'B'. From 351 to 400 assign the Grade as 'C'. From 300 to 350 the grade to be assigned is 'D'. For the total marks less than 300 No grade is assigned. A student is eligible to get a grade only when he gets 40 and above in all the subjects. In such cases the grade is―FAIL‖.(Assume that there are 10 students) |

| | |
|---|---|
| **9** | Prepare a pay-bill using a worksheet. The work sheet should contain Employee Id, Name ,Designation, |
| | Experience and Basic Salary and Job ID. If Job Id is 1 then DA is 40% of the basic salary. HRA is Rs. 4500. If Job Id is 2 then DA is 35% of the basic salary. HRA is Rs.3500. If Job Id is 3 then DA is 30% of the basic salary. HRA is Rs. 2500. If Job Id is 4 then DA is 25% of the basic salary and HRA is RS.2500. For all the other Job ids DA is 20% of the basic salary and HRA is Rs. 1500. For all the above Job ids PF to be deducted is 4%. For the job ids between1-4 Rs.100 to be deducted as<br>Professional Tax. Find the netpay. |
| **10** | For the above employee worksheet perform the following operations<br>(a) Use filter to display the details of employees whose salary is greater than 10,000.<br>(b) Sort the employees on the basis of their net pay<br>(c) Use advance filter to display the details of employees whose designation is "Programmer‖ and Net Pay is greater than 20,000 with experience greater than 2yrs |
| **11** | Using Excel project the Products ales for any five products for five years.<br>Compute the total sales of each product in the five years.<br>Compute the total sales of all the products in five year.<br>Compute the total sales of all products for each year.<br>Represent annual sale of all the products using Pie-Chart.<br>Represent annual sales of all products using Bar Chart.<br>Represent sale of a product for five years using Pie-Chart.<br>Label and format the graphs |
| **12** | Create a statement of Telephone Bill Charge for a customer.<br>Telephone Calls<br>Up to150calls- free<br>151to500calls-0.80percall<br>501 to1000calls-1.00percall<br>1001to2000-1.25percall<br>Above2000- 1.40percall |
| **13** | Perform Following:<br>(a) Using Excel write sales data with columns product, month and sales. Write at least 5 records. Create Pivot Table chart and Report for the data.<br>(b) Create a macro to change the name of worksheet as Macro Example, merge first three columns of first row and write heading as DATA in green color with yellow background.<br>(c) Link word document in excel worksheet to show the usage of linking and embedding. |
| **14** | MS Power Point<br>Assume that you are going to give a presentation about Information Technology. (Choose some latest technologies). The presentation should have minimum 10 slides. Insert appropriate images wherever necessary. Use proper formatting, Diagrams and tables. Show the usage of action buttons, hyperlinks,<br>and animations. |

# u r t

**Code: BCEECE03111** **Software Engineering** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

After completion of the course, the students will be able to:

- Analyze software process models including traditional and evolutionary models
- Design applicable solutions in one or more application domains using software design methods that integrate planning and design process
- Draw UML diagram using basic behavioral modeling and advanced structured modeling
- Deliver quality software products by possessing the effective analytical skills by applying the testing processes
- Apply new software models, techniques and technologies to design a software project for the growth of the society

### A. CO-PO Mapping

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 2 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

### B. CO-PSO Mapping

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Software Engineering Fundamentals** | **07** |
| **2.** | **Software Project Planning** | **08** |
| **3.** | **Software Design and UML** | **08** |
| **4.** | **Software Testing** | **07** |
| **5.** | **AGILE Project Management** | **07** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Software Engineering Fundamentals** |
| | • Introduction of Unit<br>• Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms<br>• Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model<br>• Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques.<br>• Conclusion of Unit |
| **2.** | **Software Project Planning** |
| | • Introduction of Unit<br>• Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model,<br>• Risk Identification and Projection: RMMM, Project scheduling and Tracking.<br>• Software Design Process, Design Principles, and Design Concepts: Effective Modular Design, Design Heuristics, Design Documentation,<br>• Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project.<br>• Conclusion of Unit |
| **3.** | **Software Design and UML** |
| | • Introduction of Unit<br>• Unified Modeling Language, Basic structures and modeling classes, common modeling techniques, relationships, common mechanism, class diagrams.<br>• Advanced structured modeling, advanced classes and relationships, interfaces, types and roles, instances and object diagram.<br>• Basic behavioral Modeling: Use cases, use case diagrams, Interaction diagram, Activity diagrams, state chart diagrams, component diagrams, deployment diagrams, patterns and frame works.<br>• Conclusion of Unit |
| **4.** | **Software Testing** |
| | • Introduction of Unit<br>• S/W Testing Fundamentals, Unit, integration, system testing, black box and white box testing Incremental testing, formal proof of correctness, software matrix<br>• Automated Testing: Introduction to Automated testing, Software testing with automated tools<br>• Conclusion of Unit |
| **5.** | **AGILE Project Management** |
| | • Introduction of Unit<br>• Agile Programming- Introduction, Flavors of Agile Development, Agile Manifesto, Refactoring Techniques, Limitations of the Agile Process.<br>• Agile Modeling: Introduction, Agile Modeling – Principles, Comparing Waterfall and Agile Modeling<br>• Scrum Methodology- The roles of Scrum, Project Artifacts, Meetings, Advantages of Scrum.<br>• Conclusion of Unit |

## E. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Software Engineering: A Practitioner‟s Approach | Roger S Pressman, Bruce R Maxim | 8th Edition | TMH. |
| 2. | Software engineering | Ian Sommerville | 9th Edition | Addison Wesley Longman |
| **Reference Book** | | | | |
| 1. | Grady Booch, James Rumbaugh, IvarJacobson.,” The Unified Modeling Language User Guide”, 2nd Edition, 2017 | | | |
| 2. | James Rumbaugh. MichealBlaha “Object oriented Modeling and Design with UML”, 2011 | | | |
| 3. | Ali Behforooz, Hudson, “Software Engineering Fundamentals”, Oxford, 2009 | | | |
| 4. | Charles Ritcher, “Designing Flexible Object Oriented systems with UML”, TechMedia , 2008 | | | |
| **Online Resources** | | | | |
| 1. | https://nptel.ac.in/courses/106105182 | | | |
| 2. | https://www.w3schools.in/sdlc/software-development-life-cycle-sdlc | | | |

**Code: BCEECE03112** **SAS Programming in VIYA** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

After completion of the course, the students will be able to:

- Connect to Cloud Analytic Services (CAS). Access and use caslibs.
- Load SAS data sets, CSV files, and Microsoft Excel files into CAS. Save SASHDAT files.
- Modify Base SAS programs to execute in CAS.
- Modify SQL procedure code to execute in CAS using FedSQL.
- Use CAS-enabled functions and procedures

### A. CO-PO Mapping

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 2 | 2 | 1 | 3 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 2 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 1 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

### B. CO-PSO Mapping

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | - | 2 | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | SAS Viya Platform Overview | 07 |
| 2. | Managing Data in SAS Cloud Analytic Services | 08 |
| 3. | Running SAS Procedures in SAS Cloud Analytic Services (CAS) | 07 |
| 4. | Modifying SQL Code to Run in SAS Cloud Analytic Services (CAS) | 08 |
| 5. | Using the Native CAS Language (CASL) | 07 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **SAS Viya Platform Overview** |
| | • Introducing the SAS Viya platform.<br>• SAS Viya programming interfaces.<br>• SAS Viya servers and processing environments<br>• Overview of running SAS code on the SAS Compute Server.<br>• SAS Viya Compute Server overview.<br>• Running SAS 9 Code on the Compute Server in SAS Viya.<br>• CAS fundamentals.<br>• Understanding caslibs. |
| **2.** | **Managing Data in SAS Cloud Analytic Services** |
| | • Introduction of Unit<br>• Loading data to in-memory tables.<br>• Accessing DBMS data.<br>• Saving and dropping in-memory tables<br>• Modifying DATA step code to run in SAS Cloud Analytic Services (CAS)<br>• .Conclusion of Unit |
| **3.** | **Running SAS Procedures in SAS Cloud Analytic Services (CAS)** |
| | • Introduction of Unit<br>• Introduction to SAS procedures in SAS Viya.<br>• Running CAS-enabled SAS procedures.<br>• Conclusion of Unit |
| **4.** | **Modifying SQL Code to Run in SAS Cloud Analytic Services (CAS)** |
| | • Introduction of Unit<br>• Modifying SQL code to run in CAS.<br>• Column data types in CAS.<br>• Conclusion of Unit |
| **5.** | **Using the Native CAS Language (CASL)** |
| | • Introduction to CASL.<br>• Using CAS actions. |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | The Little SAS Enterprise Guide Book | Susan Slaughter & Lora Delwiche | Latest | SAS |
| 2 | SAS Certification Prep Guide | | 3rd | SAS Institute |
| **Reference Book** | | | | |
| 1 | Learn SAS By example A Programmer Guide By Ron Cody | | | |

| Online Resources | |
|---|---|
| 1 | https://www.sas.com/de_de/training/courses/learning-formats/e-learning.html |

| Code: BCEECE03121 | Theory Of Computation | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**
Students will be able to:

- Use the concepts and techniques of discrete mathematics for theoretical computer science.
- Identify different formal languages and their relationship.
- Classify and construct grammars for different languages and vice-versa.
- Build finite automata, push down automata and Turing machine.
- Analyze various concepts of undecidability and Computable Function
- Discuss analytically and intuitively for problem-solving situation.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 2 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 2 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Review of Mathematical Theory | 07 |
| 2. | Regular Languages and Finite Automata | 08 |
| 3. | Context free grammar (CFG) | 08 |
| 4. | Pushdown Automata, CFL And NCFL | 07 |
| 5. | Turing Machine (TM) | 07 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Review of Mathematical Theory** |
| | • Introduction of Unit<br>• Sets, Functions, Logical statements, Proofs, Relations,<br>• Languages, Principal of Mathematical Induction,<br>• Strong Principle, Recursive Definitions,<br>• Structural Induction.<br>• Conclusion of Unit |
| **2.** | **Regular Languages and Finite Automata** |
| | • Introduction of Unit<br>• Regular Expressions, Regular Languages, Application of Finite Automata,<br>• Automata with output - Moore machine & Mealy machine,<br>• Finite Automata, Memory requirement in a recognizer,<br>• Definitions, union- intersection and complement of regular languages, Non Deterministic Finite Automata,<br>• Conversion from NFA to FA, Non Deterministic Finite Automata, Conversion of NFA to NFA<br>• Kleene's Theorem, Minimization of Finite automata, Regular And Non Regular Languages – pumping lemma.<br>• Conclusion of Unit |
| **3.** | **Context free grammar (CFG)** |
| | • Introduction of Unit<br>• Definitions and Examples, Unions Concatenations And Kleene's of Context free language,<br>• Regular Grammar for Regular Language, Derivations and Ambiguity ,<br>• Unambiguous CFG and Algebraic Expressions, BacosNaur Form (BNF), Normal Form – CNF.<br>• Conclusion of Unit |
| **4.** | **Pushdown Automata, CFL And NCFL** |
| | • Introduction of Unit<br>• Definitions, Deterministic PDA, Equivalence of CFG and PDA & Conversion,<br>• Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL.<br>• Conclusion of Unit |
| **5.** | **Turing Machine (TM)** |
| | • Introduction of Unit<br>• TM Definition, Model Of Computation,<br>• Turing Machine as Language Acceptor,<br>• TM that Compute Partial Function, Church Turning Thesis,<br>• Combining TM, Variations Of TM, Non Deterministic TM, Universal TM,<br>• Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy.<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Theory of Computer Science: Automata, Languages and Computation | Mishra & Chandrashekhar | 3rd | PHI |
| 2. | An Introduction to Formal Languages and Automata | Peter Linz | 6th | Mass Market Paperback |
| **Reference Book** | | | | |
| 3. | Introduction to Languages and the Theory of Computation, 4th by John Martin, Tata Mc Graw Hill | | | |
| 4. | Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc | | | |
| 5. | Compiler Design By Alfred V Aho, Addison Weslley | | | |
| **Online Resources** | | | | |
| 4. | http://en.wikipedia.org/wiki/Theory_of_computation | | | |
| 5. | http://meru.cecs.missouri.edu/courses/cecs341/tc.html | | | |
| 6. | https://www.geeksforgeeks.org/introduction-of-theory-of-computation/ | | | |

**Code : BCEECE03122 Statistical Foundation of data Science 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Apply the skills of data preprocessing.
- Identify the relationship between data dependencies using statistics
- Implement machine learning techniques to data science applications.
- Apply various data visualization tools to Data.
- Apply suitable tools for the real world Data Science applications

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to Data science | 06 |
| 2. | Describing Data | 08 |
| 3. | Machine Learning | 08 |
| 4. | Data Visualizations | 07 |
| 5. | Computing for Data Science | 07 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1 | **Introduction to Data science** |
| | • Introduction of Unit<br>• Definition of Data science<br>• Need for data science<br>• Benefits and uses<br>• Facets of data<br>• Data science process<br>• Conclusion of the unit |
| 2 | **Describing Data** |
| | • Introduction of Unit<br>• Frequency distributions<br>• Outliers<br>• Relative frequency distributions<br>• Cumulative frequency distributions<br>• Frequency distributions for nominal data<br>• Interpreting distributions :graphs, averages, mode, median, mean<br>• Averages for qualitative and ranked data<br>• Describing variability : range, variance, standard deviation, degrees of freedom, interquartile range variability for qualitative and ranked data<br>• Conclusion of the unit |
| 3 | **Machine Learning** |
| | • Introduction of Unit<br>• Machine learning techniques<br>• Regression Pearson's r value<br>• Clustering<br>• k-means algorithm<br>• Classification<br>• Types of classification algorithms<br>• Decision tree classification<br>• Conclusion of the unit |
| 4 | **Data Visualizations** |

| | |
|---|---|
| | • Introduction of Unit<br>• Data Visualizations<br>• The Big Three<br>• Picking the Most Appropriate Design Style<br>• Selecting the Appropriate Data Graphic Type<br>• Web-Based Applications for Visualization Design<br>• Designing Data Visualizations for Collaboration<br>• Visualizing Spatial Data with Online Geographic Tools.<br>• Conclusion of the unit |
| **5** | **Computing for Data Science** |
| | • Introduction of Unit<br>• Using Python for Data Science<br>• Sorting Out the Python Data Types<br>• Putting Loops to Good use in Python<br>• Basics of Numpy arrays in Python<br>• Data manipulation with Pandas<br>• Using Open Source R for Data Science<br>• R's Basic Vocabulary<br>• Delving into Functions and Operators<br>• Doing Data Science with Excel<br>• Making Life Easier with Excel.<br>• Conclusion of the unit |

**C. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Introducing Data Science | David Cielen, Arno D. B. Meysman, and Mohamed Ali | Fourth Edition | Manning |
| 2. | Statistics | Robert S. Witte and John S. Witte | Eleventh Edition | Wiley |
| 3. | Python Data Science Handbook | Jake Vander Plas | | O'Reilly |
| 4. | Data Science for Dummies | Lillian Pierson | Second Edition | John Wiley & Sons publications, 2017 |
| **Reference Book** | | | | |
| 1. | Think Stats: Exploratory Data Analysis in Python, Green Tea Press, Allen B. Downey. | | | |

| Online Resources | |
|---|---|
| 1. | https://www.edx.org/learn/data-science |
| 2. | https://www.udemy.com/courses/development/data-science |
| 3. | https://www.coursera.org/browse/data-science |

**Code :BCEECE03123 Analytics Programming Fundamental 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Student will able to

- Understand the fundamental concepts of analytics and programming languages commonly used in data analysis.
- Acquire skills in collecting, cleaning, and preprocessing data from various sources for analysis.
- Gain proficiency in exploratory data analysis, data visualization, and summarizing data patterns
- Develop the ability to perform statistical analysis, hypothesis testing, and interpret statistical results for data-driven decision-making.
- Build a foundation in machine learning, including training and evaluating machine learning models for predictive analytics tasks.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

C. **OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Analytics and Programming Basics** | **07** |
| **2.** | **Data Collection and Preprocessing** | **08** |
| **3.** | **Exploratory Data Analysis (EDA)** | **08** |
| **4.** | **Statistical Analysis and Hypothesis Testing** | **07** |
| **5.** | **Machine Learning Fundamentals** | **07** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Analytics and Programming Basics** |
| | • Introduction of Unit<br>• Introduction to analytics, data science, and their applications<br>• Overview of programming languages commonly used in analytics (Python, R, etc.)<br>• Basic concepts of programming: variables, data types, operators, and control structures<br>• Introduction to data manipulation and analysis libraries (e.g., Pandas, NumPy)<br>• Conclusion of Unit |
| **2.** | **Data Collection and Preprocessing** |
| | • Introduction of Unit<br>• Data collection methods: web scraping, APIs, databases, etc.<br>• Data cleaning and preprocessing techniques<br>• Handling missing data and data imputation<br>• Data transformation and feature engineering<br>• Conclusion of Unit |
| **3.** | **Exploratory Data Analysis (EDA)** |
| | • Introduction of Unit<br>• Introduction to EDA and its importance in data analysis<br>• Data visualization using libraries like Matplotlib and Seaborn<br>• Descriptive statistics and data summarization<br>• Identifying patterns, trends, and outliers in the data<br>• Conclusion of Unit |
| **4.** | **Statistical Analysis and Hypothesis Testing** |
| | • Introduction of Unit<br>• Foundations of statistical analysis: probability, distributions, and hypothesis testing<br>• Performing hypothesis tests for means, proportions, and correlations<br>• Interpreting and drawing conclusions from statistical results<br>• Implementing statistical tests using libraries like SciPy and Statsmodels<br>• Conclusion of Unit |
| **5.** | **Machine Learning Fundamentals** |
| | • Introduction of Unit<br>• Introduction to machine learning and its types (supervised, unsupervised, etc.)<br>• Training and evaluation of machine learning models<br>• Classic machine learning algorithms: linear regression, logistic regression, decision trees, etc.<br>• Introduction to model evaluation metrics (accuracy, precision, recall, etc.)<br>• Conclusion of Unit |

E. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | "Python for Data Analysis" | Wes McKinney | 2nd | O'Reilly Media |
| 2. | "Introduction to Statistical Learning: with Applications in R" | Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani | 1st | Springer |
| **Reference Book** | | | | |
| 1. | “Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost, Tom Fawcett O'Reilly Media | | | |

**Code :BCEECE03124** **Cyber Crime Law and IPR** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Student will able to

- Get the knowledge about cyber crime and get awareness about cyber crime
- Differentiate the cyber crime and the provision for it
- Know about the cyber crime act law and the rules about copy right
- Get the knowledge about computer forensic and its requirement.
- Learn about the Indian cyber laws and its usage

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Cyber Crime Introduction** | **07** |
| **2.** | **Indian Cyber Laws-I** | **08** |
| **3.** | **Indian Cyber Laws-II** | **08** |
| **4.** | **Computer Forensics** | **07** |
| **5.** | **Copyright and Cyber law** | **07** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Cyber Crime Introduction** |
| | • Introduction of Unit<br>• Cyber Crime Introduction (Need for cyber law, Evolution of key terms and concepts)<br>• Cyber Crime Introduction (Cyber Crimes and Jurisprudence of Cyber Law, What is cyber law and IPRs, Need for cyber law, Evolution of key terms and concepts<br>• Need for cyber law, Evolution of key terms and concepts, Cyber Crimes and Jurisprudence of Cyber Law, What is cyber law and IPRs<br>• Introduction of IT Act, Introduction Conventional Crime ,Cyber Crime,Reasons for Cyber Crime<br>• Classification of Conventional and Cyber Crime, Difference between Conventional and Unconventional Cyber Crime<br>• Cyber Criminal Mode and Manner of Committing Cyber Crime, Computer crime prevention measures<br>• Conclusion of Unit |
| **2.** | **Indian Cyber Laws-I** |
| | • Introduction of Unit<br>• Provisions in Indian Laws in dealing with Cyber Crimes and its critical analysis, Information Technology Act, 2000, Penalties and Offences under IT Act<br>• Offences related with Digital Signature and Electronic Signature under IT Act, Statutory Provisions<br>• Establishment of Authorities under IT Act and their functions, powers such as Controller, Certifying Authorities ,Cyber Regulation Appellate Tribunal, Adjudicating officer<br>• Conclusion of Unit |
| **3.** | **Indian Cyber Laws-II** |
| | • Introduction of Unit<br>• International Organizations and their roles such as ICANN,URDP,WTO and TRIPS<br>• Evolution of IT Act ,Digital/ Electronic Signature- Analysis in the background of Indian Laws<br>• E-Commerce; Issues and provisions in Indian Law<br>• EGovernance; concept and practicality in India, ETaxation issues in Cyberspace<br>• Conclusion of Unit |
| **4.** | **Computer Forensics** |
| | • Introduction of Unit<br>• Introduction, Subdivisions, Steps of Computer Forensics, Analyzing the Suspected Computer<br>• Incidence Response, Digital Forensic Science, The need for Computer Forensics<br>• Cyber Forensics and Digital Evidence<br>• Digital Forensics Life Cycle, Chain of custody concept and Challenges in Computer Forensics, Forensic Imaging<br>• Conclusion of Unit |
| **5.** | **Copyright and Cyber law** |
| | • Introduction of Unit<br>• Concept of Copyright and Patent in Cyberspace, Copyright in the Digital Medium<br>• Copyright in Computer Programmes, Copyright and WIPO Treaties<br>• Concept of Patent Right, Relevant provisions of Patent Act 1970<br>• Data Storage on a Hard Drive, Data Storage on a Hard Drive, Hard Disk Drive addressing<br>• Hard Disk Drive addressing, File corruption and Recovery, Fundamentals of drive imaging<br>• Cloning and Issues in Imaging<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Cyber security - understanding cyber crimes,computer forensics and legal perspectives | Nina godbole and sunit belapure | 1st | WILEY |
| 2. | Computer Forensics: Principles And Practices | Linda Volonino, Reynaldo Anzaldua And Jana Godwin | 1st | PEARSON |
| **Reference Book** | | | | |
| 3. | System Forensics Ankit Fadia,Boonlia, Prince Komal, 1st Vikas Publication | | | |
| 3. | Cyber law in India, Farooq Ahmad 1st Pioneer Publishers, New Delhi | | | |
| 4. | Information technology law and practice, Sharma Vakul, Universal Law Publishing Co Ltd | | | |
| **Online Resources** | | | | |
| 5. | http://www.vjolt.net/vol12/issue3/v12i3_a1-Azam.pdf | | | |
| 6. | https://www.wipo.int/export/sites/www/amc/en/docs/wipointaudrp.pdf | | | |
| 7. | http://www.iibf.org.in/documents/Cyber-Laws-chapter-in-Legal-Aspects-Book.pdf | | | |

**Code : BCEECE03125** **Installation and Configuration of Server** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Elaborating the basic concepts of selection, configuration and installation of Server.
- Articulate and planning of server, its configuration along with various types of data base and server.
- Explore knowledge about server role in the real environment.
- Discover and configure Print and Document Services and Servers for Remote Management using Server
- Articulate and planning of Local storage, its configuration along with various types of file systems and Formats.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction of Server** | **07** |
| **2.** | **Installing and Configuring Window's Servers 2022** | **08** |
| **3.** | **Installing and Configuring RHEL 9.1 Servers** | **08** |
| **4.** | **Installing and Configuring SQL Server 2022** | **07** |
| **5.** | **Installing and Configuring Oracle Database 21c server** | **07** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction of Server** |
| | • Introduction of Unit<br>• Introduction-characteristics –types of servers-c/s<br>• Building blocks-c/s OS: base services-extended services- GUI vs.<br>• OOUI. Base Middleware: NOS-RPC-Peer-to-Peer<br>• Communication-sockets-SQL database servers-SQL<br>• Database server architecture-trigger,<br>• Stored procedures-rules.<br>• Conclusion of Unit |
| **2.** | **Installing and Configuring Window's Servers 2022** |
| | • Introduction of Unit<br>• Introduction of window's server ,Edition, Supporting Server Role,<br>• Installing Windows Server 2012:<br>• System Requirement, Types of Window's server Core Capabilities, Upgrade paths<br>• Installing Windows Server and Migration Tools<br>• Configuring Servers: Post-Installation Tasks, Configuring NIC Teaming, Using Roles<br>• Manager,<br>• Configuring Servers: Active Directory ,Active Directory Federation,<br>• Network Policy Access Services (NPAS),Dynamic Host Configuration Protocol<br>• (DHCP) Server,<br>• Domain Name System (DNS) Server, Web & Application Servers, Printer, File Services Server, FTP<br>• Conclusion of Unit |
| **3.** | **Installing and Configuring RHEL 9.1 Servers** |
| | • Introduction of Unit<br>• Introduction of RHEL Server, System Requirement, Type of Linux Server ,Capabilities of Linux Server<br>• Installing RHEL Server, Repository installation.<br>• Configuring Servers : FTP, Domain Name System (DNS) Server, Web & Application Servers.<br>• Conclusion of Unit |
| **4.** | **Installing and Configuring SQL Server 2022** |
| | • Introduction of Unit<br>• Introduction of SQL server, Hardware Requirements<br>• SQL Server installation, Completing the SSMS Install<br>• Connecting to your Database, Creating a Database for your Assignments<br>• Dual Booting Versus Using a Virtual Machine<br>• Conclusion of Unit |
| **5.** | **Installing and Configuring Oracle Database 21c server** |
| | • Introduction of Unit<br>• Introduction of Oracle Database 21c server, Hardware Requirements<br>• Oracle Database 21c server installation in Linux or Windows<br>• Create User , Connect User, Create Data base, Data base Connect to User<br>• Conclusion of Unit |

## E. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Fedora 9 and Red Hat Enterprise Linux Bible | Christopher Negus | | |
| 2. | Windows Server 2022 Beginners Guide | Howard J. Wall | 2022 | |
| **Reference Book** | | | | |
| 3. | Windows Server 2022 & Powershell, Sara Perrott, Dummies | | | |
| 4. | Red Hat Enterprise Linux 8 Administration, Miguel Perez Colino, Pablo Iranzo, Packt Publishing | | | |
| 5. | Oracle 19c Database Administration, Tanveer A | | | |
| **Online Resources** | | | | |
| 6. | https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/9 | | | |
| 7. | https://github.com/PacktPublishing/Red-Hat-Enterprise-Linux-RHEL-9-Administration | | | |
| 8. | https://docs.oracle.com/en/cloud/saas/supply-chain-management/22b/index.html | | | |

| Code :BCEECE03126 | Introduction to UI/UX | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Student will able to

- Gain knowledge about the critical importance of user interface design
- Use learned skills to solve problems of various layouts of User Experience Design
- Apply the functionality of different design in web designing
- Properly select and utilize design thinking processes and UX/UI tools
- Develop ideas and various app designs and website pages.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction To HCI | 08 |
| 2. | UX Introduction | 09 |
| 3. | Mobile UI Design | 09 |
| 4. | Best Practices In UI Design | 07 |
| 5. | Prototype & Test | 07 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to HCI** |
| | • Introduction of Unit<br>• Introduction to HCI<br>• HCI and Software Engineering<br>• Models of HCI — Cognitive, Interactive<br>• Fitt's Law<br>• Communication & Collaboration Models<br>• Programming Interactive System<br>• Task Analysis<br>• Guidelines in HCI<br>• Conclusion of unit |
| **2.** | **UX Introduction** |
| | • Introduction of Unit<br>• User Interaction with the products, applications and services<br>• Why User Experience Design<br>• What is User Experience (UX) Design<br>• Core elements of User Experience.<br>• How these elements work together.<br>• Defining the UX Design Process and Methodology<br>• Visual Design Principles<br>• Information Design and Data Visualization<br>• Conclusion of Unit |
| **3.** | **Mobile UI Design** |
| | • Introduction of Unit<br>• Mobile Interaction Styles: Keypads, Touchpads, Gestures<br>• Disruption & Innovation<br>• Screen Design and Layouts<br>• UX Tools for Wire framing and Prototyping<br>• UX Tools for User Research and User Testing<br>• UX Tools for Organizing Information<br>• Conclusion of Unit |
| **4.** | **Best Practices in UI Design** |
| | • Introduction of Unit<br>• Introduction to Perl<br>• Mobile UI Best practices HTML & CSS<br>• HTML Tags and forms<br>• CSS - Properties<br>• Mobile UI Best practices JS<br>• Conclusion of Unit |
| **5.** | **PROTOTYPE & TEST** |
| | • Introduction of Unit<br>• What is Usability Testing?<br>• Types of Usability Testing<br>• Usability Testing Process<br>• How to prepare and plan for the Usability Tests?<br>• Prototype your Design to Test?<br>• Quality assurance |

| | |
|---|---|
| | • Alpha testing<br>• Launching you project<br>• Support<br>• Post launch activities<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Human Computer Interaction | Alan Dix, Janet Finlay | 3rd edition 2004 | Pearson Education |
| 2. | The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques | Wilbert 0. Galitz | 3rd edition 2007 | Wiley |
| 3. | Human Computer Interaction | Alan Dix, Janet Finlay | 3rd edition 2004 | Pearson Education |
| **Reference Book** | | | | |
| 1. | UX for Dummies, Donald Chesnut , Kevin P. Nichols , 2014,Wiley India Pvt. Ltd | | | |
| 2. | UX for beginners, Mekkie Bansil,2016,O Really | | | |
| **Online Resources** | | | | |
| 1. | https://learnui.design/ | | | |
| 2. | https://www.skillshare.com/browse/ui-ux-design | | | |
| 3. | https://www.youtube.com/watch?v=LupF26_Zs5Y | | | |

| Code : BUACHU3208 | Communication Skills-I | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Demonstrate depth of understanding, observing complexity, improve insight and develop independent thought and persuasiveness.
- Determine the main ideas of the text by using key details and compare & contrast the most important points with the help of their perspective.
- Practice the qualities of writing style by applying the concepts of sentence conciseness, accuracy, readability, coherence and by avoiding wordiness or ambiguity.
- Distinguish words and phrases as per their intonation patterns and interpret the audios based on different situations
- Demonstrate the understanding of impactful conversational skills, presentation skills & telephonic conversation by considering the need of the audience.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Intrapersonal/Interpersonal Skills** | **6** |
| **2.** | **Reading Skills** | **4** |
| **3.** | **Writing Skills** | **6** |
| **4.** | **Listening Skills** | **4** |
| **5.** | **Speaking Skills** | **5** |

**B. DETAILED SYLLABUS**

| | LIST OF ACTIVITIES |
|---|---|
| **1.** | Self – Awareness & Self-Introduction |
| 2. | Goal Setting: Ambition induced, interest induced or environment conditioned |
| **3.** | Cultivating Conversational Skills |
| 4. | Role Plays : Selection of varied plots, characters & settings |
| **5.** | Reading skills I: Newspaper Reading & General Article Reading |
| **6.** | Writing Skills I: Story Making by jumbled words |
| **7.** | Understanding and Applying Vocabulary |
| 8. | Listening Skills I: Types and practice by analyzing situational listening |
| **9.** | Speaking Skills I: JAM |
| 10. | PowerPoint Presentation Skills-I |
| **11.** | Telephonic Etiquettes and Communication |
| 12. | Recognizing, understanding and applying communication style (Verbal/Non-Verbal) |

| Code :BULCSE3201 | Skill Enhancement Generic Course-III | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOMES:**

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

| | LIST OF LABS |
|---|---|
| 1 | Objective Building, Parts of speech, Nouns, Numbers & Genders, Importance of soft skills |
| 2 | Logarithms, Number Theory |
| 3 | Tenses |
| 4 | Number system- Fractions & Decimals |
| 5 | Stress Management Techniques, Critical Thinking |
| 6 | Modal Verbs & Conditional Tense, Working under pressure |
| 7 | Boosting brain power for fast learning & unlearning |
| 8 | Pronouns, Adverbs & Adjectives |
| 9 | Emotional Intelligence, 5 levels of listening |
| 10 | Remainder Theoram |
| 11 | Points, lines & angles |
| 12 | Article Writing |

| Code :BUVCCE3101 | Digital Marketing | 2 Credits [LTP: 2-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- have an adequate analyzing of Digital Marketing, its scope, objectives, opportunities and it challenges
- help students develop create toward Digital Strategy building & its effectiveness.
- applying alternatives for Dynamic organization to ensure their success in highly competitive sale environment and to analyze the concept of Internet marketing and its applications
- analyze the digital tools effectively for Social Media Marketing.
- help students develop an understanding toward E-mail marketing and its various application

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **An overview of Digital Marketings** | **05** |
| **2.** | **Digital Marketing Planning and Structure** | **04** |
| **3** | **Internet Marketing** | **05** |
| **4.** | **Social Media Marketing** | **05** |
| **5.** | **E-mail marketing and Applications** | **05** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **An overview of Digital Marketing** |
| | • Introduction of Unit<br>• Introduction to Digital Marketing<br>• Different Ways to Market Your Business Online<br>• Evolution of Digital Marketing<br>• Status of Digital Marketing in India<br>• How Digital Marketing Works<br>• Traditional vs. Digital Marketing<br>• New Trends for Online Marketers<br>• Digital Marketing Strategies<br>• 6 Cs of Digital Marketing<br>• Impact of Digital Marketing on Business<br>• Benefits of Digital Marketing<br>• Drawbacks of Digital Marketing<br>• Internet Marketing in India – Challenges<br>• Conclusion of Unit |
| 2. | **Digital Marketing Planning and Structure** |
| | • Introduction of Unit<br>• Creating initial digital marketing plan<br>• Target group analysis, In bound vs Outbound Marketing,<br>• Content Marketing, Understanding Traffic, Understanding Leads Strategic Flow for Marketing Activities.<br>• WWW, Domains, Buying a Domain, Website Language & Technology, Core<br>• Objective of Website and Flow<br>• One Page Website, Strategic Design of Home Page, Optimization of Web sites,<br>• Application of Word Press in Digital Marketing, Application of CSS, HTML & Java Script for web page design<br>• Conclusion of Unit |
| 3. | **Internet Marketing** |
| | • Introduction of Unit<br>• Marketing and Internet<br>• Market place to Marketspace<br>• Online buyer behavior, suppliers, Intermediaries Websites<br>• Types of Websites, Web portals like: B2B, B2C,C2B,C2C, B2E(Business to Employee)<br>• Social Networking<br>• The promise and challenges of online marketing<br>• The Indian Internet Marketing Mix.<br>• Significance of Internet marketing.<br>• Traditional vs. Online Marketing<br>• Conclusion of Unit |
| 4. | **Social media Marketing** |
| | • Introduction of Unit<br>• Introduction of Social Media Marketing<br>• How Social media marketing works<br>• Different components or Tools for Social Media Marketing<br>• Facebook Marketing, Google Ad Words<br>• YouTube Marketing, Content Marketing<br>• Meme marketing, Affiliate Marketing<br>• LinkedIn, Twitter, Instagram |

| | |
|---|---|
| | • Keywords with SEO marketing- On page Search Engine Optimisation, Off page SEO, why search<br>• Engine marketing.<br>• SEM and its application, Benefits of SEM<br>• Blogging as a marketing strategy, Types of Blogs, What is Blogging? Benefits of Blogging. Pitfalls of Blogging.<br>• Conclusion of Unit |
| **5.** | **E-mail Marketing and Applications** |
| | • Introduction of Unit<br>• Introduction of E-mail marketing<br>• E-mail Marketing - What is it? Why do it and How?<br>• Types of E-mail Marketing<br>• Comparison to Traditional Mail<br>• Opt-in E-mail Advertising<br>• How to deal with Spam Filter<br>• Choosing your metrics<br>• Tracking Landing Pages<br>• Topl0 Benefits of E-mail Marketing<br>• E-mail-Marketing Strategy Checklist<br>• Effective E-mail Marketing Techniques<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Digital Marketing | Dave Chaffey | 7 th | Pearson |
| 2. | Marketing 4.0: Moving from Traditional to Digital Hardcover | Philip Kotler | Latest | Pearson |
| | **Reference Book** | | | |
| 1. | Digital Marketing, Dave Chaffey/Fiona Ellis, Pearson | | | |
| 2. | Social Media Marketing All-In-One For Dummies, JanZimmerman and Deborah | | | |
| 3. | Digital Marketing Strategy, Simon Kingsnorth, KoganPage | | | |
| | **Online Resources** | | | |
| 1. | https://ejournal.lucp.net/index.php/ijrtbt/article/view/191 | | | |
| 2. | https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3638929 | | | |
| 3. | https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3308684 | | | |

t t

**Code: BCECCE4101** **Computer Networks** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Gain the knowledge of the basic computer network technology and become familiar with layered communication architectures (OSI and TCP/IP).
- Analyze the basics of Framing and Error detection including parity, checksums, and CRC.
- Gain the knowledge of the basic IP configuration used for Networking. Also clear the concept of Logical and Physical Addressing
- Analyze the concepts of reliable data transfer and how TCP implements these concepts.
- Learn the principles of WAN routing and the semantics.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Networking Fundamentals & Internet** | 09 |
| 2. | **Basics Presentation & Application Layer** | 07 |
| 3. | **Basics of Transport layer & Network, Layer** | 08 |
| 4. | **Basics of Data Link Layer** | 07 |
| 5. | **Basics of WAN Technology** | 07 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Networking Fundamentals & Internet** |
| | • Basics of Network & Networking, Types of Networks: LAN, MAN, WAN, Peer-to-Peer & Client/Server, Workgroup Vs. Domain, Network Topologies. The Internet, Network Devices- NIC, Hub, Switch, Bridge, Router, Gateways, Firewall, Repeater, CSU/DSU, and modem, Introduction of OSI model, and TCP/IP Model, Comparison between OSI model & TCP/IP model. Physical Layer: Types of Transmission Media, Communication Modes, Wiring Standards and Cabling- straight through cable, crossover cable, rollover cable, Media connectors (Fibre optic, Coaxial, and TP etc.) Switching Methods (Circuit/Packet Switching) Uni-cast, Multicast, Broadcast<br>• Conclusion & Real Life Application |
| 2. | **Basics Presentation & Application Layer** |
| | • Presentation Layer protocols:-TLS, SSL, MIME<br>• Application Layer: Functions and support, Application Layer Protocols: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP, NTP.<br>• Conclusion & Real Life Application |
| 3. | **Basics of Transport layer & Network, Layer** |
| | • Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets<br>• Network Layer: Internet Protocol (IP), IP standards, versions, functions, The IPv4 Datagram Format, IPv4 addressing, IPv4 address Classes, IPv4 address types, Default Gateway, Public & Private IP Address, methods of assigning IP address, Subnet Mask and subneting, IPv6 address, types, assignment, Data encapsulation, Introduction to Routing and Switching concepts.<br>• Conclusion &Real Life Application |
| 4. | **Basics of Data Link Layer** |
| | • Application of Data Link Layer: Framing and Error detection and correction. Stop and Wait protocol, Sliding Window protocols Go-Back-N Protocol, Channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols. Wireless Networking, Types of Wireless Networks: Ad-hoc mode, Infrastructure mode, wireless LAN standards: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, wireless security Protocols: WEP,WPA, 802.1X.<br>• Conclusion & Real Life Application |
| 5. | **Basics of WAN Technology** |

| | |
|---|---|
| | • What Is a WAN?, WAN Switching, WAN Switching techniques Circuit Switching, Packet Switching etc., Connecting to the Internet : PSTN, ISDN, DSL, CATV, Satellite-Based Services, Last Mile Fibre, Cellular Technologies<br>• Connecting LANs: Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual LAN, Virtual Private Networking<br>• Conclusion &Real Life Application |

E. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Computer Network | AndrewS. Tanenbaum | 2013 | Pearson |
| 2. | Computer Networking: Top Down Approach | Kurose. Ross | 2017 | Pearson |
| **Reference Book** | | | | |
| 3. | Networking All in One – Doug Lowe 7th edition Publisher- Wiley | | | |
| **Online Resources** | | | | |
| 4. | https://www.edx.org/learn/computer-networking | | | |
| 5. | https://www.youtube.com/watch?v=VwN91x5i25g | | | |

| Code: BCECCE4102 | OOPS With Java | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Acquire the concepts and features of object oriented programming
- Learn java's exception handling mechanism, multithreading, packages and interfaces.
- Implement object oriented programming concepts using java
- Apply object oriented programming features and concepts for solving given problem
- Implement the concept of class and objects with access control to represent real world entities.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Java** | 08 |
| 2. | **Working with classes ,objects and Inheritance** | 09 |
| 3. | **Packages, Interfaces & Exception Handling** | 09 |
| 4. | **Multithreaded Programming & Applet** | 07 |
| 5. | **JAVA Database Connectivity (JDBC) and Java 8 Features** | 07 |

**B. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Java** |
| | • Introduction to Unit<br>• History and Overview of Java<br>• Object Oriented Programming features.<br>• Class Fundamentals<br>• Declaring objects, Assigning object reference variables.<br>• Literals, variables comments, separators,<br>• Scope and Life Time of Variables<br>• Data types - Integers, Floating point, characters, Boolean,<br>• Type conversion and casting<br>• Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence.<br>• Conclusion of unit |
| 2. | **Working with classes, objects and Inheritance** |
| | • Introduction to Unit<br>• Control Statements – Selection Statements - if, Switch, Iteration Statements - While, Do-while, for Nested loops, Jump statements.<br>• Methods - constructors, “this” keyword, finalize ( ) method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects.<br>• Recursion, Access control, introducing final, understanding static.<br>• Introducing Nested and Inner classes.<br>• Command line arguments.<br>• Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance. |

| | |
|---|---|
| | • Conclusion of Unit |
| **3.** | **Packages, Interfaces & Exception Handling** |
| | • Introduction to Unit<br>• Definition and Implementation, Access protection importing packages.<br>• Interfaces: Definition and implementation.<br>• Exception Handling – Fundamentals, types, Using try and catch<br>• Multiple catch clauses<br>• Nested try Statements, Throw, finally.<br>• User Defined Exception<br>• Conclusion of Unit |
| **4.** | **Multithreaded Programming & Applet** |
| | • Introduction of Unit<br>• Java thread model – main thread, creating single Multithreading<br>• Is alive ( ) and join ( ) Methods<br>• Thread – Priorities, Synchronization<br>• Inter thread communication, suspending, resuming and stopping threads<br>• Reading control input, writing control output, Reading and Writing files.<br>• Applet Fundamentals – AWT package<br>• AWT Event handling concepts.<br>• Conclusion of Unit |
| **5.** | **JAVA Database Connectivity (JDBC) and Java 8 Features** |
| | • Introduction to Unit<br>• Database connectivity – JDBC architecture and Drivers.<br>• JDBC API - loading a driver, connecting to a database, creating and executing JDBC statements<br>• Handling SQL exceptions.<br>• Accessing result sets: types and methods.<br>• JDBC application to query a database.<br>• Introduction to java 8 features :-Functional Interfaces And Lambda Expressions<br>• Conclusion of Unit |

**C. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | The complete reference Java –2 | Herbert Schildt | V Edition, | TMH. |
| 2. | SAMS teach yourself Java – 2 | Rogers Cedenhead and Leura Lemay | 3rd Edition, | Pearson Education |
| **Reference Book** | | | | |
| 1. | Object Oriented Programming with Java PUBLISHER PHI by M.T. Somashekara (Author), D.S. Guru (Author), K.S. Manjunatha (Author) | | | |
| 2. | **“**Head First Java” by Kathy Sierra | | | |
| **Online Resources** | | | | |
| 1. | https://www.programiz.com/java-programming/online-compiler/ | | | |
| 2. | https://www.tutorialspoint.com/compile_java_online.php | | | |
| 3. | https://onecompiler.com/java | | | |

**Code: BCECCE4103 Relational Database Management System 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Describe DBMS architecture, physical and logical database designs, database modeling, relational, hierarchical and network models.
- Identify basic database storage structures and access techniques such as file organizations, indexing methods including B-tree, and hashing.
- Learn and apply structured query language (SQL) for database definition and database manipulation.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Analyze various transaction processing, concurrency control mechanisms and database protection.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Database Management System** | **7** |
| **2.** | **RDBMS** | **7** |
| **3.** | **SQL** | **7** |
| **4.** | **PL/SQL** | **8** |
| **5.** | **Oracle, Trigger and wrapping** | **7** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Database Management System** |
| | • Introduction to Database Management System<br>• Characteristics of database approach<br>• Advantages of DBMS<br>• Schemas: Three schema architecture - The external level, the conceptual level and the internal level.<br>• Data Independence<br>• Database languages and Interfaces<br>• Roles of Database Administrator<br>• Introduction to Data Models (Hierarchical, Network and Relation)<br>• Entity type, Entity sets, Attributes and keys.<br>• The ER Model: ER Diagram & Database design with the ER Model<br>• Conclusion of the Unit |
| **2.** | **RDBMS** |
| | • Introduction to Distributed Database<br>• Classification of DBMS<br>• Introduction to RDBMS<br>• Relational Model –Concepts<br>• Relational operations (Insert, delete, update, select, project, rename, union, intersection, minus, Join, division)<br>• Transactions and ER mapping Examples<br>• Normalization of RDBMS (1NF, 2NF, 3NF and 4NF) and inference rules.<br>• Conclusion of the Unit |
| **3.** | **SQL** |
| | • Introduction to Unit<br>• DBMS v/s RDBMS<br>• Introduction to SQL: Data types, Constraints<br>• Commands in SQL: Create table, Drop command, Alter Queries in SQL<br>• Statements in SQL (Insert, delete and update)<br>• Features of SQL<br>• Manipulation of data<br>• Tables in SQL<br>• Conclusion of the Unit |
| **4.** | **PL/SQL** |
| | • Introduction to PL/SQL<br>• Approaches to database programming: with function calls, Embedded SQL using CURSORs, Dynamic SQL, SQL commands in Java, Retrieving multiple triples using Iterators<br>• Advantages of PL/SQL<br>• Features of PL/SQL :Blocks structure, Error handling, Input and output designing, variables and constant, data abstraction, control structures and subprogram<br>• Fundamentals of PL/SQL : character sets, lexical, delimeters, identifiers, declarations, scope and visibility, Static and dynamic and static SQL, Implicit and explicit locking<br>• Conclusion of the Unit |
| **5.** | **Oracle, Trigger and wrapping** |
| | • Introduction to Oracle, Trigger and wrapping<br>• Functions/responsibilities of DBA<br>• Oracle product details<br>• Oracle files, System and User process<br>• Oracle Memory<br>• Protecting data: Oracle backup & recovery<br>• Triggers - types, uses, data access for triggers |

| | |
|---|---|
| | • PL/SQL Packages and Wrapping<br>• Conclusion of the Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Database System Concepts | S. Sudarshan, Henry F. Korth, Avi Silberschatz | 6th Edition | McGraw Hill |
| 2. | SQL, PL/SQL | Ivan Bayross | | Bpb |
| 3. | Oracle Complete Reference | Kevin Loney | | Bpb |
| **Reference Book** | | | | |
| 4. | PL/SQL, best practices, Bpb Publications, Steven Feuerstein | | | |
| 5. | The Oracle Cook Book, Bpb Publications, Liebschuty | | | |
| 6. | Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey | | | |
| **Online Resources** | | | | |
| 7. | https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm | | | |
| 8. | https://nptel.ac.in/courses/106106093 | | | |
| 9. | https://www.coursera.org/learn/introduction-to-relational-databases | | | |

| Code: BCECCE4104 | Advance Data Structure | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Explain the basic principles and operations of data structures.
- Analyze algorithms and to determine algorithm correctness and time efficiency class.
- Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.
- Apply the concepts of advanced Trees and Graphs for solving problems effectively.
- Analyze the given scenario and choose appropriate Data Structure for solving problems.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Hashing** | **07** |
| **2.** | **Priority Queues (Heaps)** | **08** |
| **3.** | **Trees** | **07** |
| **4.** | **Graphs Algorithms** | **07** |
| **5.** | **Disjoint Sets and String Matching** | **07** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Hashing** |
| | • Introduction to Hashing<br>• Hash Function<br>• Separate Chaining<br>• Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library<br>• Universal Hashing<br>• Extendible Hashing.<br>• Conclusion of Unit |
| **2.** | **Priority Queues (Heaps)** |
| | • Introduction to Priority Queues (Heaps)<br>• Model<br>• Simple implementations<br>• Binary Heap: Structure Property, Heap Order Property,<br>• Basic Heap Operations: insert, delete, Percolate down<br>• Other Heap Operations<br>• Introduction toBinomial Queues<br>• Binomial Queue Structure<br>• Binomial Queue Operations<br>• Implementation of Binomial Queue<br>• Priority Queues in the Standard Library.<br>• Conclusion of Unit |
| **3.** | **Trees** |
| | • Introduction to Trees<br>• AVL: Single Rotation, Double Rotation<br>• B-Trees<br>• Multi-way Search Trees – 2-3 Trees<br>• Searching for an Element in a 2-3 Tree<br>• Inserting a New Element in a 2-3 Tree<br>• Deleting an Element from a 2-3 Tree<br>• Red-Black Trees<br>• Properties of red-black trees: Rotations, Insertion, Deletion.<br>• Conclusion of Unit |
| **4.** | **Graphs Algorithms** |
| | • Introduction to Graphs Algorithms<br>• Elementary Graph Algorithms: Topological sort<br>• Single Source Shortest Path Algorithms: Dijkstra‘s, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall‘s Algorithm<br>• Conclusion of Unit |
| **5.** | **Disjoint Sets and String Matching** |
| | • Introduction to Disjoint Sets<br>• Equivalence relation<br>• Basic Data Structure<br>• Simple Union and Find algorithms<br>• Smart Union and Path compression algorithm.<br>• Introduction to String Matching |

| | |
|---|---|
| | • The naive string-matching algorithm<br>• The Rabin-Karp algorithm<br>• The Knuth-Morris-Pratt algorithm.<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Data Structures and Algorithm Analysis in C++ | Mark Allen Weiss | 4 th Edition | Pearson |
| 2. | Introduction to Algorithms | Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein | 3 rd Edition | The MIT Press. |
| **Reference Book** | | | | |
| 1. | Fundamentals of Computer Algorithms, 2nd Edition, 2009, University Press Pvt. Ltd, Ellis Horowitz, Satraj Sahani and Raja sekharam. | | | |
| 2. | Advanced Data Structures, Oxford University Press, 2018, ReemaThareja, S. Rama Sree. | | | |
| **Online Resources** | | | | |
| 1. | https://www.coursera.org/learn/advanced-data-structures | | | |
| 2. | https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/ | | | |
| 3. | https://nptel.ac.in/courses/106106133 | | | |
| 4. | https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures | | | |
| 5. | https://freevideolectures.com/course/2279/data-structures-and-algorithms | | | |

# r t  t r

| Code:BCECCE4201 | Computer Networks Lab | 1 Credit [LTP: 0-0-2] |
|---|---|---|

**Course Outcome:-**
Students will be able to:

- Use the clamping tool for making Cross and Straight cable and identify network IP
- Create local area network and do file sharing activity
- Configure switch and routers
- Configure WEP and Ethernet.
- Recognize static and dynamic routing.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Implementation of TCP/IP protocol – I |
| **2** | Implementation of TCP/IP protocol – II |
| **3** | Troubleshooting Scenarios Network – I |
| **4** | Troubleshooting Scenarios Network – II |
| **5** | Router – Configuration – I |
| **6** | Router – Configuration – II |
| **7** | Router – Configuration – III |
| **8** | Configuration of IP Address for a Router – I |
| **9** | Configuration of IP Address for a Router – II |
| **10** | Setting up of Passwords – I |
| **11** | Setting up of Passwords – II |
| **12** | Setting up of Passwords – III |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Data Communications and Networking, | Behrouza A. Forouzan | Fourth Edition | TMH. |
| 2. | Computer Networks | A.S.Tanenbaum | Fourth Edition | Pearson |
| **Reference Book** | | | | |
| 3. | Data Communications and Networking, TATA McGraw Hill, Ferouzan, Behrouz A. | | | |
| 4. | Data and Computer Communication, Pearson Education , Stallings William | | | |
| 5. | Computer Networks, PHI, Tanenbaum, Andrew S, | | | |
| **Online Resources** | | | | |
| 6. | https://www.edx.org/learn/computer-networking | | | |
| 7. | https://www.udemy.com/topic/computer-network/ | | | |
| 8. | https://www.coursera.org/computer_network | | | |

| Code: BCECCE4202 | OOPs with Java Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- To Implement object oriented programming concepts to solve real world problems
- To implement the concept of class and objects with access control to represent real world entities.
- Illustrate different techniques on creating and accessing packages (fully qualified name and import statements).
- Create concepts on file streams and operations in java programming for a given application programs
- Create the backend connectivity process in java program by using JDBC drivers

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | A. Write a program to print "Hello World" in Java.<br>B. Write a program to add two numbers<br>C. Write a program to demonstrate the different access specifiers<br>D. Write a program which uses different packages |
| 2 | A. Write a program to demonstrate inheritance, abstraction, encapsulation and Polymorphism.<br>B. Write a program to find the factorial of n numbers<br>C. Write a program to calculate Fibonacci series<br>D. Write a program to add n numbers and series |
| 3 | A. Write a program to create an array and store elements into the array.<br>B. Write a program to find the sum of elements in an array<br>C. Write a program to demonstrate switch case, if, if-else and for loop |
| 4 | A. Write a program to demonstrate the working of methods.<br>B. Write a program which has four methods – add(), subtract(), multiply() and divide()<br>and demonstrate a simple console calculator.<br>C. Write a program to accept command line arguments and display them to the user |
| 5 | A. Write a program to create a package.<br>B. Write a program to handle different exceptions |
| 6 | A.Write a program to demonstrate try-catch, throw and throws.<br>B. Write a program for user defined exception |
| 7 | A. Write a program to read a file<br>Write a program to write into a file |
| 8 | Write a program to demonstrate client server communication (socket programming) |
| 9 | Write a program to create threads and manipulate them |
| 10 | Write a program to create a user interface to check user authentication. |
| 11 | Write a program to create a registration form and save the details into a file |
| 12 | Write a program to save and fetch the details from database |

**A. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | The complete reference Java –2 | Herbert Schildt | 5th Edition, | TMH. |
| 2 | SAMS teach yourself Java – 2 | Rogers Cedenhead and Leura Lemay | 3rd Edition, | Pearson Education |
| **Reference Book** | | | | |
| 1 | The complete reference Java –2 | | | |
| 2 | SAMS teach yourself Java – 2 | | | |

| Online Resources | |
|---|---|
| 1 | https://www.programiz.com/java-programming/online-compiler/ |
| 2 | https://www.tutorialspoint.com/compile_java_online.php |

**Code: BCECCE4203 Relational Database Management System Lab 1 Credit [LTP: 0-0-2]**

**Course Outcome:-**

Students will be able to:

- Analyze, appreciate and effectively explain the underlying concepts of database technologies.
- Design and implement a database schema for a given problem-domain.
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1. | To setup and removal phases of a Student database using the basic Data Definition Language (DDL) commands:<br>1. CREATE<br>2. ALTER<br>3. DROP<br>4. RENAME<br>5. TRUNCATE |
| 2. | The routine operation of the Employee database like retrieve, insert and modify by basic Data Manipulation Language (DML) commands:<br>1. INSERT<br>2. UPDATE<br>3. DELETE |
| 3. | To Retrieve data from one or more tables using DATA RETRIEVAL LANGUAGE (DRL) commands<br>SELECT FROM<br>SELECT - FROM –WHERE<br>SELECT - FROM -GROUP BY<br>SELECT - FROM -ORDER BY<br>JOIN using SELECT - FROM - ORDER BY<br>JOIN using SELECT - FROM - GROUP BY<br>UNION<br>INTERSET<br>MINUS |
| 4. | DATA CONTROL LANGUAGE (DCL) and TRANSATIONAL CONTROL LANGUAGE (TCL) commands.<br>Creating objects: tables, views, users, sequences, Collections etc.<br>Privilege management through the Grant and Revoke commands<br>Transaction processing using Commit and Rollback<br>Save points. |
| 5. | Queries for following functions<br>Conversion functions (to_char, to_number and to_date)<br>string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr),<br>date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date) |
| 6. | Simple queries: selection, projection, sorting on a simple table for employee database<br>Small-large number of attributes<br>Distinct output values<br>Renaming attributes<br>Computed attributes |

| | |
|---|---|
| | Simple-complex conditions (AND, OR, NOT)<br>Partial Matching operators (LIKE, %, _, *, ?)<br>ASC-DESC ordering combinations<br>Checking for Nulls |
| 7. | To manipulate data items and returning the results using Group functions or Aggregate functions and Single Row or scalar functions:<br>Group functions or Aggregate functions: Sum(), Avg(), Min(), Max() and Count()<br>Single Row or scalar function: Abs(), Power(), Sqrt(), Round(), Exp(), Greastest(), Least(), Mod(), Floor(), Sign() and Log(). |
| 8. | Multi-table queries (JOIN OPERATIONS)<br>Simple joins (no INNER JOIN)<br>Aliasing tables – Full/Partial name qualification<br>Inner-joins (two and more (different) tables)<br>Inner-recursive-joins (joining to itself)<br>Outer-joins (restrictions as part of the WHERE and ON clauses)<br>Using where & having clauses |
| 9. | Write Nested queries to retrieve the name of each employee who has a dependent with the same first name and same sex as the employee using following Nested queries.<br>In, Not In<br>Exists, Not Exists<br>Dynamic relations (as part of SELECT, FROM, and WHERE clauses) |
| 10. | Write a query to make a list of all project numbers for projects that involve an employee whose last name is ‘Smith’, either as a worker or as a manager of the department that controls the project using the following Set Oriented Operations<br>Union<br>Difference<br>Intersection<br>Division |
| 11. | PL/SQL Programming using the following<br>Programs using named and unnamed blocks<br>Programs using Cursors, Cursor loops and records |
| 12. | PL/SQL Programming using<br>Creating stored procedures, functions and packages<br>Error handling and Exception<br>Triggers and auditing triggers |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Database System Concepts | S. Sudarshan, Henry F. Korth, Avi Silberschatz | 6th Edition | McGraw Hill |
| 2. | SQL, PL/SQL | Ivan Bayross | | Bpb |
| 3. | Oracle Complete Reference | Kevin Loney | | Bpb |
| **Reference Book** | | | | |
| 4. | PL/SQL, best practices, Bpb Publications, Steven Feuerstein | | | |
| 5. | The Oracle Cook Book, Bpb Publications, Liebschuty | | | |
| 6. | Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey | | | |
| **Online Resources** | | | | |
| 7. | https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm | | | |
| 8. | https://nptel.ac.in/courses/106106093 | | | |
| 9. | https://www.coursera.org/learn/introduction-to-relational-databases | | | |

# Minor Stream Courses

**Code: BAMCCE4101 SAS® Enterprise Guide®: ANOVA, Regression, and Logistic Regression 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Demonstrate Virtualization and able to handle partitions
- Installing the SDDC using VMware products.
- Implementing Fault tolerance and High availability for the Virtual machines
- Securing the Virtual environment.
- Resource Optimization and monitoring.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction** | **7** |
| **2.** | **Components of vSphere 6.0** | **7** |
| **3.** | **Features of vSphere and NSX** | **9** |
| **4.** | **VSphere Solutions to Data Center Challenges and vSphere Security** | **8** |
| **5.** | **Resource optimization and resource management** | **8** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Python Programming** |
| | • Introduction of Unit<br>• Introduction to Virtualization - Types of virtualization - Difference between cloud and virtualization - Physical infrastructure and virtual infrastructure - Virtualization approaches -<br>• Partitioning - Hosting - Isolation - Hardware independence - Virtual machine – Hypervisor - Types of hypervisor - Virtual machine manager - Types of hypervisor - Introduction to datacenter virtualization Esxi - Difference between Esxi and Esx - Versions of Esxi<br>• Conclusion of Unit |
| **2.** | **Components of vSphere 6.0** |
| | • Introduction of Unit<br>• Components of VMware vSphere - vSphere 6.0: Overview and Architecture - Topology of vSphere 6.0 Data Center - vSphere 6.0 Configuration MaximumsvCenter Server - vCenter<br>• Server Features - Certificate Management - Alarms and Alerts - Monitoring Features-Template Management - Linked Mode Deployment - Storage Features in vSphere – Shared Storage - Storage Protocols - Datastores - Virtual SAN - Virtual Volumes – Networking, Features in vSphere - Virtual Networking - Virtual Switches and its types<br>• Conclusion of Unit |
| **3.** | **Features of vSphere and NSX** |
| | • Introduction of Unit<br>• vSphere Resource Management Features - vMotion - Distributed Resource Scheduler (DRS) Distributed Power Management (DPM) - Storage vMotion - Storage DRS - Storage I/O Control - Network I/O Control - vSphere Availability Features - vSphere Data Protection -High Availability - Fault Tolerance - vSphere Replication - Introduction to NSX.<br>• Conclusion of Unit |
| **4.** | **VSphere Solutions to Data Center Challenges and vSphere Security** |
| | • Introduction of Unit<br>• Challenges - Availability Challenges - Scalability Challenges - Management Challenges - Optimization Challenges - Application Upgrade Challenges - Cloud Challenges - Security - Describe the features and benefits of VMware Platform Services Controller<br>• host access and authorization - Secure ESXi - vCenter Server - and virtual machines-Upgrade ESXi and vCenter Server instances<br>• Conclusion of Unit |
| **5.** | **Resource optimization and resource management** |
| | • Introduction of Unit<br>• Network Optimization - Configure and manage vSphere distributed switches - Migrate virtual machines from standard switches to distributed switches - Explain distributed switch features such as port mirroring - LACP - QoS tagging - and NetFlow - CPU Optimization – Explain the CPU scheduler operation - NUMA support - and other features that affect CPU performance<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Virtualization Essentials Paperback | Matthew Portnoy | Latest | Wiley Publications |
| 2. | VMware Cookbook Paperback | Troy- Shroff | Latest | O'Reilly |

| Reference Book | |
|---|---|
| 1. | Nelson Ruest, Danielle Ruest, Virtualization, A Beginner's Guide, McGraw Hill, 2009 |
| 2. | Cloud Computing: Concepts Technology & Architecture By Thomes Erl |
| **Online Resources** | |
| 1. | https://www.javatpoint.com/virtualization-in-cloud-computing |
| 2. | https://www.tutorialspoint.com/virtualization2.0/virtualization2.0_tutorial.pdf |

**Code:BAMCCE4201 Application of Machine Learning Using SAS(R) Viya® Lab 1 Credits [LTP: 0-0-2]**

**Course Outcome:-**

Students will be able to:

- Apply the analytical life cycle to business needs.
- Incorporate a business-problem-solving approach in daily activities.
- Prepare and explore data for analytical model development.
- Create and select features for predictive modelling.
- Develop a series of supervised learning models based on different techniques such as decision tree, ensemble of trees (forest and gradient boosting), neural networks, and support vector machines.
- Evaluate and select the best model based on business needs.
- Deploy and manage analytical models under production

## A. List of programs

| | |
|---|---|
| 1 | Discuss the problem of machine learning in business decision making. |
| 2 | Essentials of supervised prediction. |
| 3 | Data exploration, Feature extraction |
| 4 | Input transformations |
| 5 | Feature selection |
| 6 | Variable clustering |
| 7 | Decision tree introduction |
| 8 | Tree structure model |
| 9 | Recursive partitioning, Pruning |
| 10 | Ensembles of trees |
| 11 | Neural Networks Introduction, Network architecture |
| 12 | Network Learning and Optimization |
| 13 | Support vector machine: Large-margin linear classifier |
| 14 | Methods of solution |
| 15 | Non linear classifier: Kernel Trick |
| 16 | Additional tools |
| 17 | Model assessment and Deployment: Model assessment and comparison |
| 18 | Model deployment |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Virtualization Essentials Paperback | Matthew Portnoy | Latest | Wiley Publications |
| 2. | VMware Cookbook Paperback | Troy- Shroff | Latest | O'Reilly |
| **Reference Book** | | | | |
| 1. | Nelson Ruest, Danielle Ruest, Virtualization, A Beginner's Guide, McGraw Hill, 2009 | | | |
| 2. | Cloud Computing: Concepts Technology & Architecture By Thomes Erl | | | |
| **Online Resources** | | | | |
| 1. | https://www.javatpoint.com/virtualization-in-cloud-computing | | | |
| 2. | https://www.tutorialspoint.com/virtualization2.0/virtualization2.0_tutorial.pdf | | | |

| Code: BUACHU4212 | Communication Skills-II | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Develop the ability to identify difficult sounds, words and phrases to strengthen listening and applying these improved skills in spoken communication.
- Cultivating knack for reading and writing by understanding the nuances of sentence structure and presentation style.
- Applying negotiation and Identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargaining to closing.
- Develop a heightened awareness of the potential of digital communication and apply their knowledge in creating documents considering the needs of the netizens.
- Propose their outlook through exposure to new and different experiences and ideas and enrich their understanding of the issues under discussion.

**A. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Advanced Listening & Speaking Skills** | **6** |
| **2.** | **Advanced Reading & Writing Skills** | **6** |
| **3.** | **Art of Negotiation Skills** | **4** |
| **4.** | **Email Etiquettes** | **4** |
| **5.** | **Group Discussion** | **5** |

## B. LIST OF LABS

| | |
|---|---|
| 1. | Listening Skills II: Analysis of videos/audios by famous personalities |
| 2. | Speaking Skills II: Extempore, Debate etc. |
| 3. | Public Speaking: Key Concepts, Overcoming Stage Fear |
| 4. | Story-Telling Skills: Techniques of Story Telling, Prompts for story creation |
| 5. | Situational Conversational Skills |
| 6. | PowerPoint Presentation Skills-II |
| 7. | Reading Skills II: Technical Writings, Research Papers& Articles |
| 8. | Writing Skills II: Blog Writing &Review Writing |
| 9. | Picture Perception & Discussion |
| 10. | Art of Negotiation: Identify the qualities of successful and unsuccessful negotiators. Identify different negotiation situations to practice during class. |
| 11. | Email Etiquettes |
| 12. | Group Discussion: Dos &Don'ts, Informal GD |

| Code:BULCSE4201 | Skill Enhancement Generic Course-IV | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**COURSE OUTCOMES:**

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

| LIST OF LABS | |
|---|---|
| 1 | Averages, Mean, Median and Mode |
| 2 | Cognitive learning theory, Body Language basics |
| 3 | Heights & Distances |
| 4 | Sitting Arrangements |
| 5 | Fill Ups(Grammar based) |
| 6 | Error Detection, Confusing words |
| 7 | Alphanumeric Series |
| 8 | Verbal Analogy, One word substitution |
| 9 | Dices |
| 10 | Sentence Correction, Subject-Verb agreement |
| 11 | Statement & Assumptions, Setting SMART goals, |
| 12 | Persuasion Skills, Interview Preparation |

| Code:BUVCCE4102 | Business Intelligence | 2 Credits [LTP: 2-0-0] |
|---|---|---|

## COURSE OUTCOMES:

Students would be able to:

CO1: Gain knowledge of Business Intelligence
CO2: Elements of Business Intelligence Solutions
CO3: Build business projects
CO4: Generate and manage BI reports
CO5: BI Deployment, Administration & Security.

### A. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Business Intelligence** | 4 |
| 2. | **Elements of Business Intelligence Solutions** | 5 |
| 3. | **Building the BI Project** | 5 |
| 4. | **Reporting Authoring** | 5 |
| 5. | **BI Deployment, Administration & Security** | 5 |

### B. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Business Intelligence** |
| | • Introduction of the Unit<br>• Understanding the scope of today's BI solutions and how they fit into existing infrastructure. Describe BI, its components & architecture.<br>• The future of BI, better experience for all business users.<br>• The Functional Area of BI Tools, Query Tools and Reporting.<br>• OLAP and Advanced Analytic<br>• Conclusion of the Unit |
| 2. | **Elements of Business Intelligence Solutions** |
| | • Introduction of the Unit<br>• Reports & ad hoc queries.<br>• Dashboards & Scorecards development.<br>• Metadata, Real time monitoring capabilities.<br>• BI portals, web applications, Desktop applications.<br>• Conclusion & Real life applications<br>• Conclusion of the Unit |
| 3. | **Building the BI Project** |
| | • Introduction of the Unit<br>• Planning the BI project, Project Resources,<br>• Collecting User Requirements,<br>• Validating BI Requirements<br>• BI Design and Development<br>• Conclusion of the Unit |
| 4. | **Reporting Authoring** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Building reports with relational vs Multidimensional data models.<br>• Types of Reports – List, crosstabs, Statistics, Chart, map, financial etc.<br>• Data Grouping & Sorting, Filtering Reports.<br>• Conditional formatting, Adding Summary Lines to Report<br>• Conclusion of the Unit |
| **5.** | **BI Deployment, Administration & Security** |
| | • Introduction of the Unit<br>• BI Architecture<br>• Expanding BI Authentication Authorization, Access Permissions, Groups and Roles.<br>• Manage Status & Monitoring.<br>• Back Up and Restore<br>• Conclusion of the Unit |

**C. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Business Intelligence | Mark Whitehorn , Mary Whitehorn | Ist | (IBM ICE Publication). |
| 2 | Data Strategy: How To Profit From A World Of Big Data, Analytics And The Internet Of Things | Bernard Marr | 2nd | Kogan Page |
| 3 | The Data Detective: Ten Easy Rules to Make Sense of Statistics | Tim Harford | Latest | Riverhead Books |
| 4 | From Big Data to Big Profits: Success with Data and Analytics | Russell Walker | Latest | Oxford University Press |

t t

**Code: BCECCE5101** **Design & Analysis of Algorithms** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Apply Divide and conquer. Greedy algorithm design techniques.
- To handle the dynamic programming concept with solving real word problem
- To manage of different Pattern matching algorithms.
- Apply randomize algorithms

**A.** To analyze the different class of algorithms and difference between them**CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction** | **06** |
| **2.** | **Dynamic Programming, Branch and Bound** | **06** |
| **3.** | **Pattern Matching and Assignment Problem** | **08** |
| **4.** | **Randomized Algorithm** | **08** |
| **5.** | **NP-Hard and NP- Complete Problem** | **08** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction** |
| | • Introduction to Unit<br>• Algorithm Specification , Algorithm Complexity and Order Notations.<br>• Divide and Conquer Method :General Method, Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithm.<br>• Greedy Method: General method, Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Tree: Prim's, Kruskal's Algorithm<br>• Conclusion of Unit |
| **2.** | **Dynamic Programming, Branch and Bound** |
| | • Introduction to Unit<br>• Dynamic Programming: Matrix Chain Multiplication, Longest Common<br>• Subseuence and 0/1Knapsack Problem, All pairs shortest path, Flow shop scheduling<br>• Branch And Bound: Traveling Salesman Problem, Bounding, FIFO Branch and Boun d,<br>• Backtracking:The8-queensproblem,Hamiltoniancycles Comparison between Dynamic, Backtracking and Branch Bound<br>• Conclusion of Unit |
| **3.** | **Pattern Matching and Assignment Problem** |
| | • Introduction to Unit<br>• Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.<br>• Assignment Problems: Formulation of Assignment and Quadratic assignment Problem.<br>• Conclusion of Unit. |
| **4.** | **Randomized Algorithm** |
| | • Introduction of Unit.<br>• Probabilistic Analysis & Randomized Algorithms: Las Vegas algorithm, Monte Carlo algorithms for Min-Cut, randomized algorithm for 2- SAT.<br>• Problem definition of Multi commodity flow, Flow shop scheduling and Network capacity<br>• assignment problems.<br>• Conclusion of Unit |
| **5.** | **NP-Hard and NP- Complete Problem** |
| | • Introduction of Unit.<br>• Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP- Complete Problems - Satisfiability problem and Vertex Cover Problem.<br>• Approximation Algorithms for Vertex Cover and Set Cover Problem<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Fundamentals of Computer Algorithms | E.Horowitz &S.Sahani | Latest | GalgotiaPublications |
| 2. | Introduction to Algorithms | Corman,Leiserson&Rivest | Latest | MITPress |
| **Reference Book** | | | | |
| 3. | Algorithm Analysis & Design, Goodrich, Tamassia, Wiley | | | |
| 4. | Computer Algorithms, Introduction to Design and Analysis, SaraBasse, A. V. Geider | | | |
| **Online Resources** | | | | |
| 5. | https://www.javatpoint.com/daa-tutorial | | | |
| 6. | https://www.guru99.com/design-analysis-algorithms-tutorial.html | | | |
| 7. | https://www.geeksforgeeks.org/system-design-tutorial/ | | | |

| Code: BCECCE5102 | Advance Java | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Design and build web applications using servlets and JSP Mange sessions in servlets and JSP
- Identify where and when to use MVC design pattern Create custom tag in JSP
- Develop web application using struts
- Develop database application using hibernate Develop IOC and DI using springs
- Develop web application using springs.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Java Servlets** | **08** |
| **2.** | **Java Server Pages(JSP)** | **07** |
| **3.** | **Java Server Faces** | **08** |
| **4.** | **Hibernate** | **08** |
| **5.** | **Springs** | **07** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Java Servlets** |
| | • Introduction of Unit<br>• Servlets and HTTP Servlets, Filters, Security, Servlet Life Cycle, Servlets for the World Wide Web, Requests, Responses, and Headers, GET and POST, HTTP, Deploying a Servlet , Web Application Deployment Descriptor Structure, Servlet Configuration, Http Servlet Request/Response, Servlet Context, Session Management,<br>• Case Study<br>• Conclusion of Unit |
| **2.** | **Java Server Pages(JSP)** |
| | • Introduction of Unit: JavaBeans, Custom Tags and JSP Fragments, JSP Life Cycle, The Difference Between Servlets and JSP, JSP Syntax and Semantics, Elements and Template Data, JSP Configuration, Standard JSP Actions, Attributes, Comments, Quoting and Escape Characters, Exception Handling, JavaBeans and the JSP Expression Language, JSP Standard Tag Library, Custom Tag Libraries, Database Connectivity,<br>• Building a Complete Web Application.<br>• Case Study<br>• Conclusion of Unit |
| **3.** | **Java Server Faces** |
| | • Introduction of Unit: features, life cycle, manage Beans, UI Components- input Text, output Text, form, command Button, input Text Area, input Hidden, input File, Bean, Validation, facelets, JSF JDBC, JSF with controllers, architectural overview of application developed with JSF and JSP, validator tag, data tables.<br>• Conclusion of Unit |
| **4.** | **Hibernate** |
| | • Introduction of Unit: advantages, features, Architecture, Environment, Life Cycle, ORM Tool, First program, Sessions, Session factory, Persistent Class, Using the Session, MVC, Hibernate Query language, Criteria Query, Mapping Types, Annotations, Query Language, Native SQL.<br>• Case Study<br>• Conclusion of Unit |
| **5.** | **Springs** |
| | • Introduction of Unit: Architecture, Environment Setup, Create Sample Program, IOC Containers, Bean Definition, Bean Scopes, Bean Lifecycle, Dependency Injection, IOC Injection, Setter Injection, Injecting Inner Beans, Injecting Collection, Event Handling, MVC Framework.<br>• Case Study<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1. | Servlets and Java Server Pages | Jayson Falkner | | Kevin Jones-2003 |
| 2. | Beginning Hibernate | Joseph B. Ottinger, Jeff Linwood, Dave Minter | | Apress-2014 |
| **Reference Book** | | | | |
| 3. | Professional Java Development with the Spring Framework, Rod Johnson, 8th edition –Wiley | | | |
| 4. | Core Java Server Faces, David M. Geary, 2004 – 3rd Edition-Prentice Hall | | | |
| **Online Resources** | | | | |
| 5. | https://www.simplilearn.com/resources-to-learn-java-programming-article | | | |
| 6. | https://www.docdroid.net/mY1yTPu/advancedjavaprogrammingbyuttamkumarroy-pdf | | | |
| 7. | https://www.edureka.co/blog/advanced-java-tutorial | | | |

**Code: BCECCE5103** **Information System Security** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Use current techniques, skills, and tools necessary for Information Systems and Technology.
- Apply a good working knowledge of communication in Security Management.
- Illustrate the Security Architecture and demonstrate its requirements.
- Analyze and experience good knowledge of Laws.
- Evaluate the importance of Physical Security and its implementation techniques.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Information Security** | **07** |
| 2. | **Encryption and Authentication Techniques.** | **08** |
| 3. | **Risk Management** | **08** |
| 4. | **Internet Security.** | **07** |
| 5. | **Network Security** | **07** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Information Security** |
| | • Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Services and mechanisms, Conventional Cryptographic Techniques: Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography .<br>• Conclusion of the Unit |
| **2.** | **Encryption and Authentication Techniques.** |
| | • Symmetric and Asymmetric Cryptographic Techniques : DES, AES, RSA algorithms, International Data Encryption Algorithm (IDEA), Digital Certificates, Private Key Management, The PKIX Model Authentication and Digital Signatures<br>• Conclusion of the Unit |
| **3.** | **Risk Management** |
| | • Key management – Kerberos, Program Security : Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels<br>• Conclusion of the Unit |
| **4.** | **Internet Security.** |
| | • Internet Security Protocols: Introduction, Basic Concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL Versus SET, 3D Secure Protocol, Electronic Money, Email Security Wireless Application Protocol (WAP) Security<br>• Conclusion of the Unit |
| **5.** | **Network Security** |
| | • Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME<br>• Conclusion of the Unit |

## E. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Information Security Risk Analysis | Thomas R.Peltier | Third Edition, | Pub: Auerbach,2012 |
| 2. | Mark Stamp's Information Security: Principles and Practice (WIND) | DevenN.Shah, Wiley(2009) | 2009 | Wiley |

| | | | | |
|---|---|---|---|---|
| 3. | Information Systems Security: Security Management,<br>Metrics, Frameworks and Best Practices | NinaGodbole, | 2008 | Wiley |
| **Reference Book** | | | | |
| 1. | Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education | | | |
| 2. | Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson | | | |
| 3 | Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall. | | | |
| **Online Resources** | | | | |
| 1. | https://www.sans.org/cyber-security-courses/introduction-cyber-security/ | | | |
| 2. | https://nptel.ac.in/courses/106106129 | | | |

| Code: BCECCE5201 | Design & Analysis of Algorithms Lab | 1 Credit | [LTP: 0-0-2] |
|---|---|---|---|

**Course Outcome:-**

Students will be able to:

- To apply divide and conquer method to implement quick sort, merge sort, linear search, Binary search in C.
- Implement job sequencing using greedy method.
- Find the minimum cost of spanning tree.
- Implement the dynamic programming using branch and bound method.
- Implement the NP-Hard, NP-.Complete problem.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | Write a C program to implement the Stack using arrays. Write Push(),Pop(), and Display()methods to demonstrate its working. |
| 2 | Write a C program to sort a list of elements using the quick sort algorithm. The elements can be read from a file. |
| 3 | Write a C program to implement a Merge sort algorithm to a list of elements for different values of n and determine the time required to sort the elements. |
| 4 | Find the minimum cost of spanning tree in C using Prim's algorithms. |
| 5 | Find the minimum cost of spanning tree in C using Kruskal's algorithm. |
| 6 | Implement 0/1 Knapsack problem using Dynamic Programming in C. |
| 7 | Write a C program to find the shortest paths between nodes in a graph using Dijkstra's algorithm. |
| 8 | Write a C program<br><br>Print all the nodes reachable from a starting node in a digraph using BFS method.<br><br>Check whether a graph is connected or not using DFS method. |
| 9 | Write a C program to implement all pairs shortest paths problem using Floyd's algorithm. |
| 10 | Write a C program to implement N Queen's problem using Back Tracking. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Mastering Algorithms with C | Kyle Loudon | Latest | O'Reilly |
| 2. | Algorithms Illuminated (Part 3): Greedy Algorithms and Dynamic Programming | Tim Roughgarden | Kindle | |
| **Reference Book** | | | | |
| 3. | Data Structures And Algorithms Made Easy Narasimha Karumanchi kindle Edition | | | |
| **Online Resources** | | | | |
| 4. | https://www.sanfoundry.com/c-program | | | |
| 5. | https://www.thecrazyprogrammer.com/2015/03/c-program-for-n-queens-problem-using-backtracking.html | | | |

**Code: BCECCE5202 Advance Java Lab 1 Credit [LTP: 0-0-2]**

**Course Outcome:-**

Students will be able to:

- Develop dynamic web application
- Develop database application using hibernate
- Develop IOC and DI using springs
- Develop web application using springs.
- Identify where and when to use MVC design pattern Create custom tag in JSP

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Develop dynamic web application to display current system date and time using servlets |
| **2** | Develop dynamic web application to display login page with proper HTML UI elements using servlets. |
| **3** | Implement a servlet to authenticate login details, which is created previously (user name and password should be accepted using HTML and displayed using a Servlet) |
| **4** | Develop dynamic web application to manage product (prod Id, name, category, price) details using servlets. This app must have following pages<br>a. Home page<br>b. Product adding page<br>c. Product editing page<br>d. Product displaying page |
| **5** | Develop dynamic web application to manage product (prodId, name, category, price) details using servlets. This app must have following pages<br>a. Home page<br>b. Product adding page<br>c. Product editing page<br>d. Product displaying page |
| **6** | Write JSP program to implement custom tag with name <product>, which display product (prodId, name, category, price) details |
| **7** | Enhance previous JSP program to fetch data from database |
| **8** | Develop Rich Internet Applications to manage product and user details using struts and database |
| **9** | Develop Hibernate application to manage product details like insert, update, delete and display from database using HQL |
| **10** | Develop Spring based dynamic web application to manage courses, students in a college environment using Web MVC framework and JDBC |
| **11** | Transfer a file from one system to another system by the network |
| **12** | Develop Chat Server using Java. |

**B.. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Advanced Java Programming | B.Prasanalakshmi | 1st | CH Publishers |
| 2. | Advanced Java Programming | Uttam K Roy | 1st | Oxford University Press |
| 3. | Advanced Java Technology -A Conceptual Approach | A.A.Puntambekar | 1st | Technical Publications |
| **Reference Book** | | | | |

| | |
|---|---|
| 4. | Advanced Java Coding Problems: Best Advanced Coding Problems with Explanation and Solutions, by Pratap Divyansh |
| 5. | Advanced Java Optimization Techniques, by Jason Arnold |
| **Online Resources** | |
| 6. | https://www.simplilearn.com/resources-to-learn-java-programming-article |
| 7. | https://www.docdroid.net/mY1yTPu/advancedjavaprogrammingbyuttamkumarroy-pdf |

t

**Code: BAMCCE5101** **AS® Visual Text Analytics in SAS® Viya®** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Use the point-and-click interface of Model Studio and SAS Visual Text Analytics.
- Explore collections of text documents to discover key topics.
- Interpret term maps.
- Identify key textual topics automatically in your large document collections.
- Create robust models for categorizing the content according to your organization's specific needs.
- Create, modify, and enable (or disable) custom concepts and test linguistic rule definitions with validation checks within the same interactive GUI.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to SAS Visual Text Analytics | 8 |
| 2. | SAS Visual Text Analytics Demonstrations | 8 |
| 3. | SAS Visual Text Analytics Nodes | 7 |
| 4. | Concept and Category Rule Definitions | 7 |
| 5. | Case Studies | 6 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to SAS Visual Text Analytics** |
| | • SAS Visual Text Analytics<br>• Language challenges (self-study) |
| **2.** | **SAS Visual Text Analytics Demonstrations** |
| | • Converting documents for analysis using SAS Data Explorer.<br>• Creating a project with no predefined concepts.<br>• Creating a project with custom concepts. |
| **3.** | **SAS Visual Text Analytics Nodes** |
| | • Projects.<br>• Concepts and terms.<br>• Machine-generated topics.<br>• Categories.<br>• Document scoring. |
| **4.** | **Concept and Category Rule Definitions** |
| | • SAS Visual Text Analytics rules.<br>• SAS Visual Text Analytics concept rules.<br>• SAS Visual Text Analytics demo category rules. |
| **5.** | **Case Studies** |
| | • Retrieving information about anxiety and depression from drug reports.<br>• Automatic categorization of ASRS incident reports.<br>• Retrieving mortgage complaints from the CFPB customer complaints data |

## E. RECOMMENDED STUDY MATERIAL:

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Cloud Computing: Principles and Paradigms | Rajkumar Buyya, James Broberg, Andrzej M. Goscinski | | John Wiley and Sons Publications |
| 2. | Cloud Computing For Dummies | Fern Halper,Robin Bloor | | |
| **Reference Book** | | | | |
| 3. | Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008 | | | |
| 4. | Cloud Computing: Web-Based Applications That Change the Way You Work by micheal Miller | | | |

| Online Resources | |
|---|---|
| 5. | https://www.javatpoint.com/aws-tutorial |
| 6. | https://www.w3schools.com/aws/index.php |

**Code: BAMCCE5102** **R Programming** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Apply various data structure in R programming
- Create and apply function in R programming
- Design to read different file format into R
- Implement statistics and testing of hypothesis
- Apply graphs and non-parametric testing of hypothesis for real world problems in R

### A. CO-PO Mapping

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

### B. CO-PSO Mapping

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to R Environment** | **07** |
| **2.** | **Data Structures and Control Statements** | **08** |
| **3.** | **I/O operations and String Manipulations** | **08** |
| **4.** | **R for Summary Statistics and Parametric Tests** | **07** |
| **5.** | **R for Graphs, Nonparametric Tests and ANOVA** | **07** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to R Environment** |
| | • History and development of R Statistical computing programming language<br>• Installing R and R studio<br>• Getting started with R<br>• Creating new working directory<br>• Changing existing working directory<br>• Installing the available packages<br>• Calling the installed packages<br>• Variable definition in R<br>• Simple functions, vector definition and logical expressions<br>• Matrix calculation and manipulation using matrix data types<br>• Conclusion of unit |
| **2.** | **Data Structures and Control Statements** |
| | • Introduction to different data types, vectors, atomic vectors, types and tests, coercion, lists, list indexing<br>• Function applying on the lists, adding and deleting the elements of lists, attributes, name and factors , matrices and arrays,<br>• Matrix indexing, filtering on matrix, generating a covariance matrix.<br>• lapply( ) and sapply( ) on data frames<br>• Control statements.<br>• Conclusion of unit |
| **3.** | **I/O operations and String Manipulations** |
| | • Introduction to I/O functions in R<br>• Using of scan( ), readline ( ) function<br>• Comparison and usage of scan and readline function<br>• Reading different format files into R: text file, CSV file<br>• Statistical package files, xls and xlsx files<br>• Converting from one format to another using in built function<br>• Writing different file format in to the local machine directory<br>• Basics of string manipulations – grep ( ), nchar ( ), paste( ), sprintf( ), substr( ), regexpr( ), strsplit( )<br>• Testing of file name with given suffix.<br>• Conclusion of unit |
| **4.** | **R for Summary Statistics and Parametric Tests** |
| | • Descriptive statistics – summary statistics for vectors, making contingency tables, creating contingency tables from vectors.<br>• Testing tables and flat table objects, cross tables, testing cross tabulation, recreating original data from contingency tables, switching class, mean (arithmetic, geometric and harmonic)<br>• Median, mode for raw and grouped data, measure of dispersion – range, standard deviation, variance, coefficient of variation, testing of hypothesis – small sample test, large sample test – for comparing mean, proportion, variance (dependent and independent samples).<br>• Conclusion of unit |
| **5.** | **R for Graphs, Nonparametric Tests and ANOVA** |

| | |
|---|---|
| | • Introduction to graphs<br>• Box-Whisker Plot, Scatter plots, pairs plots, line chart, Pie Chart and Bar Charts<br>• Non-parametric test: The Wilcoxon U-Test (Mann-Whitney): One and Two-Sample U-Test, Tests for association: Chi Square Tests<br>• Yates Correction for 2X2 Tables, single category goodness of fit tests,<br>• Analysis of Variance for one-way variation and two variation<br>• Conclusion of unit |

## E. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Beginning R: The statistical Programming Language | Dr. Mark Gardener | Latest Edition | John Wiley & Sons, Inc. |
| 2. | The art of R programming | Norman Matloff | Latest Edition | no starch Press, San Francisco |
| **Reference Book** | | | | |
| 1. | Introduction to Probability and Statistics for Engineers and Scientists, Owen Jones, Robert Maillardet and Andrew Robinson | | | |
| 2. | The R Book, CRC Press, latest edition, Hadley Wickham | | | |
| 3. | Learning from Data", AML Book Publishers, Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin | | | |
| **Online Resources** | | | | |
| 1. | https://www.r-project.org/about.html | | | |
| 2. | https://nptel.ac.in/courses/111104100 | | | |
| 3. | https://www.w3schools.com/r/ | | | |

| Code: BAMCCE5201 | Neural network: Essentials (SAS) Lab | 1 Credit [LTP: 0-0-2] |
|---|---|---|

**Course Outcome:-**

Students will be able to:

- Understand the core concept of neural networks
- Essential practices of real-world application
- Discover how to adjust the models essential parameters to solve different types of business challenges
- Build autoencoders for a predictive model
- Perform an intelligent automatic search of the model hyperparameter values

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | Programmatically build neural networks in SAS 9.4 and SAS Viya. |
| 2 | Modify neural networks' parameters for better performance. |
| 3 | Conduct automatic search for neural networks' hyperparameters through genetic algorithms. |
| 4 | Enhance data with autoencoders and synthetic observations. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Cloud Computing: Principles and Paradigms | RajkumarBuyya, James Broberg, Andrzej M. Goscinski | | John Wiley and Sons Publications |
| 2. | Cloud Computing For Dummies | Wesley J. Chun, Prentice Hall | 1999 | McGraw Hill International Edition |
| **Reference Book** | | | | |
| 3. | Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online – Michael Miller - Que 2008 | | | |

| Code: BAMCCE5202 | R Programming Lab | 1 Credit | [LTP: 0-0-2] |
|---|---|---|---|

**Course Outcome:-**

Students will be able to:

- Install R Studio and set up a working environment.
- Implement basic R operations such as taking data input, removing missing values, and importing data into R using different formats xlsx, CSV, Text files and manipulate the data.
- Develop code snippets for formal data exploration in R programming environment.
- Create and edit visualizations with R.
- Explore data sets to create testable hypotheses and identify appropriate statistical tests in real world problems.

**A. LIST OF EXPERIMENTS:**

| PART - A | |
|---|---|
| 1 | Install and configure R, set working directory. |
| 2 | Install Packages and calling installed packages. |
| 3 | R studio environment and functionalities of R studio |
| 4 | Implement basic R operations (data input, missing values, importing data into R using different formats : xlsx, CSV, Text files) |
| 5 | Use R as a calculator/ |
| 6 | Explore various functionalities of dataframes. |
| 7 | Create data set using data frames, list and tables. |
| 8 | Calculate the remainder after dividing 31079 into 170166719. |
| 9 | Calculate the interest earned after 5 years on an investment of $2000, |
| 10 | Assuming an interest rate of 3% compounded annually. |
| 11 | Use R to calculate the area of a circle with radius 7 cm. |
| 12 | Do you think there is a difference between 48:14ˆ2and 48:(14ˆ2)? |
| 13 | Usingrep()and seq()as needed, create the vectors?<br>0000011111222223333344444 and 1234512345123451234512345 |
| 14 | Create the vector<br>## [1]000111100011110001111000111100011<br>## [34] 1 1<br>and convert it to a factor. Identify the levels of the result, and then change the level labels to obtain the factor:<br>## [1] Male Male Male Female Female Female Female Male Male |

| | |
|---|---|
| | ## [10] Male Female Female Female Female Male Male Male Female<br>## [19] Female Female Female Male Male Male Female Female Female<br>## [28] Female Male Male Male Female Female Female Female<br>## Levels: Male FemaleExplore various functionalities of plots |
| | **PART - B** |
| 15 | Create the contingency table for the given raw data. |
| 16 | Create the interactive user input code line in r using readline ( ) function. |
| 17 | Create the contingency table for the given vector format data. |
| 18 | Convert the contingency table to original format of the given data. |
| 19 | Analyse and give interpretation of summary statistics for the given data. |
| 20 | Calculate mean, median and mode for the grouped data and compare the results for the given data. |
| 21 | Analyse the given data for non-parametric tests and give the interpretations. |
| 22 | Use R for test the given data<br>In order to compare the effectiveness of two sources of nitrogen, namely ammonium chloride (NH4Cl) and urea, on grain yield of Coarse cereal, an experiment was conducted. The results on the grain yield of Coarse Cereal (kg/plot) under the two treatments are given below.<br>NH4Cl : 13.4, 10.9, 11.2, 11.8, 14.0, 15.3, 14.2, 12.6, 17.0, 16.2, 16.5, 15.7.<br>Urea : 12.0, 11.7, 10.7, 11.2, 14.8, 14.4, 13.9, 13.7, 16.9, 16.0, 15.6, 16.0.<br>Assess which source of nitrogen is better for Coarse Cereal. |
| 23 | Use R to test the given data and interpret the results.<br>In a health survey of school children, it is found that the mean hemoglobin level of 55 boys is10.2 per 100ml with a SD of 2.1. Can we consider this group as taken from a population with a mean of 11.0 g/100ml? |
| 24 | In a hearing survey among 246 town school children, 36 were found with conductive hearing loss and among 349 village school children 61 were found with conductive hearing loss. Does this present any evidence that conductive hearing loss is as common among town children as among village children? |
| 25 | In an experiment to compare two types of Goat foods A and B, the following results of increase in weight were observed in Goats. |

| Goat No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Increase in weight due to A | 49 | 53 | 51 | 52 | 47 | 50 | 52 |
| Increase in weight due | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| to B | 2 | 5 | 2 | 3 | 0 | 4 | 4 |

Assuming the two samples are independent can we conclude food B is better than food A?

26 Before an increasing in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increasing in duty, 800 people were tea drinkers in a sample of 1200 people. Using SE of a proportion, state whether there is a significant decrease in consumption of tea after the increase in the exercise duty.

27 Use R for test the given data

A health status survey in a few villages revealed that the normal serum protein value of children in that locality is 7.0 g/100ml. A group of 16 children who received high protein food for a period of six months had serum protein values shown below. Can we consider that the mean serum protein level of those who were fed on high protein diet is different from that of the general population?

| S.No. (Child No.) | 1 | 2 | 3 | 4 | 5 | 6 | | |
|---|---|---|---|---|---|---|---|---|
| Protein level (g%) | 7.10 | 7.70 | 8.20 | 7.56 | 7.05 | 7.08 | | |

| S.No. (Child No.) | | | | | | | | 16 |
|---|---|---|---|---|---|---|---|---|
| Protein level (g%) | | | | | | | | .56 |

28 Students were selected to training. Their performance was noted by giving a test and the marks recorded out of 50. They were given effective 6 months training and again they were given a test and marks were recorded out of 50.

| Farmers | | | | | | | | 8 | | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Before training | | | | | | | | 4 | | 48 |
| After training | | | | | | | | 30 | | 46 |

By applying the t-test can it be concluded that the students have benefited by the training?

29 100 individuals of a particular race were tested with an intelligence test and classified into two classes. Another group of 120 individuals belong to another race were administered the same intelligence test and classified into the same two classes. The following are the observed frequencies of the two races:

| Race | Intelligence | | |
|---|---|---|---|
| | Intelligent | Non-intelligent | Total |
| Race I | 42 | 58 | 100 |
| Race II | 55 | 65 | 120 |
| Total | 97 | 123 | 220 |

Test whether the intelligence is anything to do with the race.

28 Obtain the correlation coefficient between the heights of father(X) and of the son (Y) from the following data

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| X | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| Y | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

And also test its significance. Using R functions.

29 Analyze the given data for analysis of variance and interpret the same for all the possible values.

30 Consider the inbuilt data set cars.

- Find Correlation between possible variables and pairwise correlation
- Find regression line between appropriate variables

Display the summary statistics and comment on the results

## B. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Beginning R: The statistical Programming Language | Dr. Mark Gardener | | John Wiley & Sons, Inc |
| 2. | The R Book | Michael J. Crawley | | Wiley & Sons, Inc |
| **Reference Book** | | | | |
| 1 | R graphics cookbook: practical recipes for visualizing data. O'Reilly Media, 2018, Chang, Winston. | | | |
| **Online Resources** | | | | |
| 1. | https://www.simplilearn.com/ | | | |
| 2. | https://www.w3schools.com/ | | | |

| Code:BUACHU5218 | Professional Skills-I | 1 Credit | [LTP: 0-0-2] |
|---|---|---|---|

CO1: Compare the professional and personal approach towards any task and demonstrate their understanding by displaying professional attitude in the assigned tasks.
CO2: Recognize, explain, and use the formal elements of specific genres of organizational communication: reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents etc...
CO3: Prepare and deliver a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.
CO4: Demonstrate preparedness for any type of interview from classic one-on-one interview to panel interviews, Phone/Skype interviews, Behavioral/Situational etc. along with sharping the ability to critically analyze a given piece of information and collectively work in a group to arrive at a solution or develop a perspective.
CO5: Understand negotiation and time management to identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargaining to closing.

| UNIT NO. | UNIT NAME | HOURS |
|---|---|---|
| 1 | **Professional Attitude & Approach** | 6 |
| 2 | **Professional Writing-I** | 8 |
| 3 | **Presentation Skills: Structure Study** | 2 |
| 4 | **Interview Skills & Group Discussion** | 4 |
| 5 | **Negotiation Skills & Time Management** | 4 |

| LIST OF LABS | |
|---|---|
| 1. | Professional & Ethical Approaches: Degree of adherence, Business world & meeting deadlines |
| 2. | Job Hunting and Networking: Skill Branding & Usage of Online Platforms |
| 3. | Trust Building & Cultural Etiquettes |
| 4. | Professional Writing-I: Direct-Indirect approaches to Business Writing-Five main stages of writing Business Messages. |
| 5. | Professional Email Writing |
| 6. | Resume Building-I: Difference between C.V. & Resume, formats, points to cover, practice sessions |
| 7. | E-Learning & E-Content Development-I |
| 8. | Presentation Skills: format & structure of presentations, using tools & techniques |
| 9. | Job Interviews I: Preparation and Presentation |
| 10. | Advanced Group Discussion – I |
| 11. | Negotiation Skills & and Conflict Resolution-I |
| 12. | Professional Code of Ethics & Effective Time Management |

| Code: BULCSE5201 | Skill Enhancement Generic Course-V | 1 Credit | [LTP: 0-0-2] |
|---|---|---|---|

**COURSE OUTCOMES:**

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

| LIST OF LABS | |
|---|---|
| 1 | Problems on Age, Cause & Effect |
| 2 | Career Development, Stress Management |
| 3 | Conflict Management, Data Interpretation |
| 4 | Sitting Arrangements |
| 5 | Written Communication, Behavioral interview skills |
| 6 | Error Detection, Confusing words |
| 7 | Number series, Speed, Time & distance |
| 8 | Linear Equations, Points, lines & angles |
| 9 | Allegations & Mixtures, Data sufficiency |
| 10 | Articles & Prepositions, Modal Verbs & Conditional Tense |
| 11 | Pronouns, Adverbs & Adjectives, Emotional Intelligence |
| 12 | Managing pressure & maintaining balance |

t t

**Code: BCECCE6101** **Big Data Analytics** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Provide HDFS Concepts and Interfacing with HDFS
- Access and Process Data on Distributed File System
- Manage Job Execution in Hadoop Environment
- Explain the components of Hadoop and Hadoop Eco-System
- Apply Machine Learning Techniques using R

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Big Data And Hadoop** | **07** |
| **2.** | **HDFS(Hadoop Distributed File System)** | **08** |
| **3.** | **Map Reduce** | **08** |
| **4.** | **Hadoop Eco System** | **07** |
| **5.** | **Data Analytics with R** | **07** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Big Data And Hadoop** |
| | • Introduction of Unit<br>• The Design of HDFS, HDFS Concepts, Command Line Interface,<br>• Hadoop file system interfaces, Data flow,<br>• Data Ingest with Flume and Scoop and Hadoop archives,<br>• Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures<br>• Conclusion of Unit |
| **2.** | **HDFS (Hadoop Distributed File System)** |
| | • Introduction of Unit<br>• The Design of HDFS, HDFS Concepts, Command Line Interface,<br>• Hadoop file system interfaces, Data flow,<br>• Data Ingest with Flume and Scoop and Hadoop archives,<br>• Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures<br>• Conclusion of Unit |
| **3.** | **Map Reduce** |
| | • Introduction of Unit<br>• Anatomy of a Map Reduce Job Run, Failures,<br>• Job Scheduling, Shuffle and Sort,<br>• Task Execution, Map Reduce Types and Formats, Map Reduce Features.<br>• Conclusion of Unit |
| **4.** | **Hadoop Eco System** |
| | • Introduction of Unit<br>• Pig : Introduction to PIG, Execution Modes of Pig,<br>• Comparison of Pig with Databases, Grunt, Pig Latin,<br>• User Defined Functions, Data Processing operators. Hive : Hive Shell,<br>• Hive Services, Hive Metastore, Comparison with Traditional Databases,<br>• HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.<br>• Big SQL : Introduction<br>• Conclusion of Unit |
| **5.** | **Data Analytics with R** |
| | • Introduction of Unit<br>• Machine Learning: Introduction, Supervised Learning,<br>• Unsupervised Learning, Collaborative Filtering,<br>• Big Data Analytics with BigR,<br>• Conclusion with R |

E. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Hadoop: The Definitive Guide | Tom White | Third Editon | O'reily |
| 2. | Big Data Analytics | Seema Acharya, Subhasini Chellappan | 2015 | Wiley |
| **Reference Book** | | | | |
| 1. | Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. | | | |
| 2. | Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013) | | | |
| 3. | Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R | | | |
| **Online Resources** | | | | |
| 1. | http://www.bdbanalytics.ir/media/1121/big-data-analytics_turning-big-data-into-big-money.pdf | | | |
| 2. | https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics | | | |
| 3. | https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm | | | |

**Code: BCECCE6102** **Computer Architecture** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Explain the organization of basic computer, its design and the design of control unit.
- Demonstrate the working of central processing.
- Describe the operations and language f the register transfer, micro-operations and input- output organization.
- Organize memory and memory management hardware.
- Elaborate advanced concepts of computer architecture, Parallel Processing, inter processor communication and synchronization.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Basics Of Digital Logics** | **8** |
| **2.** | **Register Transfer and Micro-operation** | **8** |
| **3.** | **Basic Computer Organization** | **8** |
| **4.** | **Micro Programmed Control Unit** | **6** |
| **5.** | **Computer Arithmetic** | **6** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Basics Of Digital Logics** |
| | • Introduction of Unit<br>• Number systems : Binary number system, Octal & Hexa-decimal number system, Conversion of Number System, r's & (r-1)'s, Binary arithmetic Operations,<br>• Logic Gates: AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates.<br>• Boolean algebra: AND, OR, Inversion, Basic Boolean Law's, Demorgan's theorem, Minimization techniques: K -Map, Sum of Product & Product of Sum,.<br>• Conclusion & Real Life Application |
| **2.** | **Register Transfer and Micro-operation** |
| | • Introduction of Unit<br>• Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer.<br>• Logic Micro-operations: List of Logic micro operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit.<br>• Conclusion &Real Life Application |
| **3.** | **Basic Computer Organization** |
| | • Introduction of Unit<br>• Instruction Codes, Computer Registers: Common bus system, Computer Instructions<br>• Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions.<br>• Conclusion & Real Life Applications |
| **4.** | **Micro Programmed Control Unit** |
| | • Introduction of Unit<br>• Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines.<br>• Central Processing unit: Introduction of CPU.<br>• Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory,<br>• Associative Memory, Cache Memory, Virtual Memory<br>• Conclusion & Real Life Application |
| **5.** | **Computer Arithmetic** |
| | • Introduction of Unit<br>• Modes of Data Transfer: Priority Interrupt, Direct Memory Access,<br>• Introduction, Addition and Subtraction,<br>• Multiplication Algorithms (Booth algorithm), Division Algorithms,<br>• Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors.<br>• Conclusion &Real Life Application |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Computer System Architecture | Morris Mano | PHI | |
| 2. | Computer Organization and Architecture | William Stallings | PHI | |

| Reference Book | |
|---|---|
| 1. | Digital Computer Electronics: An Introduction to Microcomputers, Malvino, TMH |
| 2. | PC Hardware in a Nutshell Barbara Fritchman Thompson, Robert Bruce, Thompson, O'Reilly, 2nd Edition , 2010 |
| 3. | Fundamentals of Computer Organization and Architecture, Mostafa AB-EL-BARR and Hesham EL-REWNI by John Wiley and Sons |
| **Online Resources** | |
| 1. | https://www.javatpoint.com/computer-organization-and-architecture-tutorial |

| Code: BCECCE6103 | SalesForce | 3 Credits [LTP: 3-0-0] |
|---|---|---|

**COURSE OUTCOME**

Students will be able to:

- Understand the fundamental concepts and components of the Salesforce platform.
- Develop proficiency in using Salesforce tools and features for sales, marketing, and customer relationship management.
- Gain practical skills in configuring and customizing Salesforce to meet specific business needs.
- Learn to leverage Salesforce reporting and analytics capabilities for data-driven decision-making.
- Acquire knowledge of best practices for Salesforce administration and user management.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Introduction to Salesforce** | 07 |
| 2 | **Salesforce Configuration and Customization** | 08 |
| 3 | **Salesforce Sales and Marketing Automation** | 08 |
| 4 | **Salesforce Data Management and Analytics** | 07 |
| 5 | **Salesforce Administration and User Management.** | 07 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Salesforce** |
| | • Overview of the Salesforce platform and its capabilities.<br>• Introduction to Salesforce editions and licenses.<br>• Exploring the Salesforce user interface and navigation.<br>• Understanding Salesforce data model: objects, records, and relationships.<br>• Introduction to key Salesforce features: accounts, contacts, leads, and opportunities. |
| **2.** | **Salesforce Configuration and Customization** |
| | • Customizing Salesforce layouts, fields, and page layouts.<br>• Creating custom objects and relationships.<br>• Configuring validation rules, workflows, and process automation.<br>• Introduction to Apex triggers and custom development.<br>• Integrating external systems with Salesforce using APIs. |
| **3.** | **Salesforce Sales and Marketing Automation** |
| | • Implementing Salesforce sales processes and methodologies.<br>• Managing leads, opportunities, and sales pipelines.<br>• Utilizing Salesforce automation tools: workflow rules, process builder, and approval processes.<br>• Introduction to Salesforce marketing automation: campaigns, email templates, and lead scoring.<br>• Tracking and analyzing sales and marketing performance with Salesforce reports and dashboards. |
| **4.** | **Salesforce Data Management and Analytics** |
| | • Importing and exporting data in Salesforce.<br>• Implementing data validation and de-duplication strategies.<br>• Understanding Salesforce data security and access controls.<br>• Building custom reports and dashboards for data analysis.<br>• Leveraging Salesforce Einstein Analytics for advanced data visualization and insights. |
| **5.** | **Salesforce Administration and User Management.** |
| | • Managing Salesforce users, profiles, and permissions.<br>• Implementing role hierarchies and sharing rules.<br>• Monitoring and maintaining data quality in Salesforce.<br>• Performing system audits and troubleshooting common issues.<br>• Best practices for managing Salesforce releases and upgrades. |

D. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Salesforce CRM: The Definitive Admin Handbook" | Paul Goodey | 5th Edition | Packt Publishing |
| 2. | Salesforce Essentials for Administrators | Mohith Shrivastava and Vivek Deepak | 3rd Edition | Apress |
| **Reference Book** | | | | |
| 3. | "Mastering Salesforce CRM Administration" by Rakesh Gupta and Sagar Pareek 4th Edition Packt Publishing | | | |
| **Online Resources** | | | | |
| 1. | https://trailhead.salesforce.com/ | | | |
| 2. | https://help.salesforce.com/ | | | |
| 3. | https://www.linkedin.com/learning/topics/salesforce | | | |

| Code: BCECCE6201 | Big Data Analytics Lab | 1 Credit | [LTP: 0-0-2] |
|---|---|---|---|

**Course Outcome:-**

Students will be able to:

- Identify the key issues in big data management and experiment with Hadoop framework.
- Develop problem solving and critical thinking skills in Hadoop.
- Develop problem solving and critical thinking skills in Map Reduce.
- Construct and Explain with structure and unstructured data by using NoSQL commands.
- Implement fundamental enabling techniques and scalable algorithms for data stream mining

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Hadoop Installation: Ubuntu & THEL 9 Operating System in stand-alone mode |
| **2** | File Management tasks in Hadoop |
| **3** | Implement the following Data structures in Java:<br>Linked Lists, Stacks, Queues, Set, Map |
| **4** | Word Count Map Reduce program to understand Map Reduce |
| **5** | Implement the following file management tasks in Hadoop:<br>Adding files and directories<br>Retrieving files<br>Deleting files |
| **6** | Implement Matrix Multiplication with Hadoop Map Reduce |
| **7** | Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data. |
| **8** | Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes |
| **9** | Weather Report POC-Map Reduce Program to analyses time-temperature statistics and generate report with max/min temperature. |
| **10** | Implementing Matrix Multiplication with Hadoop Map Reduce |
| **11** | Pig Latin scripts to sort, group, join, project, and filter your data. |
| **12** | Hive Databases :Tables, Views, Functions and Indexes |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Hadoop in Practice | Alex | 2014 | |
| 2. | Big Data | Holmes | 2016 | Black Book |
| 3. | Big Data and Hadoop | V.K. Jain | 2017 | |
| **Reference Book** | | | | |
| 1. | Hadoop Practice Guide,"Jisha Mariam Jose" | | | |
| 2. | Hadoop: The Definitive Guide ,"Tom White",O'Relly | | | |
| **Online Resources** | | | | |
| 1. | https://ia600201.us.archive.org/7/items/HadoopInPractice/Hadoop%20in%20Practice.pdf | | | |

| Code: BCECCE6202 | Sales Force Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**Course Outcome:-**

Students will be able to:

- Understand the key features and components of the Salesforce platform.Navigate the Salesforce user interface and explore different objects and records.
- Practice customizing Salesforce layouts, fields, and page layouts.Create and modify custom objects and relationships.
- Implement workflow rules to automate routine tasks in Salesforce.Configure process builder and approval processes for streamlined workflows.
- Import and manage data in Salesforce, ensuring data integrity.Create custom reports and dashboards to analyze Salesforce data.
- Develop Apex triggers for customizing Salesforce behavior.
- Integrate Salesforce with external systems using APIs.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Navigate through the Salesforce user interface and understand the different objects and records. |
| **2** | Practice customizing Salesforce layouts, fields, and page layouts.<br>Create custom objects and relationships in Salesforce. |
| **3** | Implement workflow rules to automate business processes in Salesforce.<br>Configure process builder and approval processes for streamlined workflows. |
| **4** | Import sample data into Salesforce and ensure data integrity.<br>Perform data deduplication and validation techniques. |
| **5** | Create custom reports and dashboards to analyze Salesforce data.<br>Apply filters, groupings, and summarize data in reports. |
| **6** | Manage user profiles, roles, and permissions in Salesforce.<br>Implement sharing rules and define data access controls. |
| **7** | Set up a Salesforce campaign to track and manage marketing activities.<br>Create email templates and monitor campaign performance. |
| **8** | Learn the basics of Apex triggers and their role in customizing Salesforce behavior.<br>Write and deploy a simple Apex trigger for a specific use case. |
| **9** | Implement more complex Apex triggers or classes to address specific business requirements.<br>Test and debug Apex code using Salesforce Developer Console. |
| **10** | Build a custom Lightning app using the Lightning App Builder.<br>Customize the app's components and layout to meet specific needs. |
| **11** | Integrate Salesforce with an external system using APIs |
| **12** | Send and receive data between Salesforce and the external system |

# Minor Stream Courses

**Code: Code:BAMCCE6101 Natural Language Processing 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Analyse semantics and syntactic parsing in natural language processing.
- Comprehend the basic concepts of natural language processing and its important terminologies.
- Generate the natural language for given English statements at basic level.
- Know the importance of corpus creation in natural language processing.
- Learn and implement the important statistical techniques used in natural language processing.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to Natural Language Processing | 8 |
| 2. | Syntactic Parsing and Semantic Analysis | 8 |
| 3. | Natural Language Generation | 7 |
| 4. | Corpus Creation | 8 |
| 5. | Statistical Techniques in Natural Language Processing | 8 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1 | **Introduction to Natural Language Processing** |
| | • Introduction of unit<br>• Introduction to text pre-processing, terminologies related with text processing, challenges of text pre-processing, tokenization, sentence segmentation.<br>• Introduction to lexical analysis, finite state morphonology, finite state morphology, morphology vs lexical analysis, paradigm based lexical analysis.<br>• Conclusion of unit |
| 2 | **Syntactic Parsing and Semantic Analysis** |
| | • Introduction of unit<br>• Introduction to syntactic parsing, The Cocke–Kasami–Younger Algorithm, parsing as deduction, Implementing Deductive Parsing, LR Parsing, Constraint-based Grammars, Issues in Parsing, Basic Concepts and Issues in<br>• Natural Language Semantics, Theories and Approaches to Semantic Representation, Relational Issues in Lexical Semantics, Fine-Grained Lexical-Semantic Analysis.<br>• Conclusion of the Unit |
| 3 | **Natural Language Generation** |
| | • Introduction of Unit<br>• Introduction to natural language generation, simple Examples of Generated Texts, The Components of a Generator: Components and level of representation, |
| | • Approaches to Text Planning: The Function of the Speaker, Desiderata for Text Planning, Pushing vs. Pulling.<br>• Planning by Progressive Refinement of the Speaker's Message, Planning Using Rhetorical Operators, Text Schemas, The Linguistic Component: Surface Realization Components, Relationship to Linguistic Theory, Chunk Size, Assembling vs. Navigating, Systemic Grammars, Functional Unification Grammars<br>• Conclusion of the Unit |
| 4 | **Corpus Creation** |
| | • Introduction of Unit<br>• Introduction and definition of corpus in natural language processing, corpus size, Balance, Representativeness, and Sampling, Data Capture and Copyright, Corpus Markup and Annotation, Multilingual Corpora, Multimodal Corpora, Corpus Annotation Types<br>• Morphosyntactic Annotation, Treebanks: Syntactic, Semantic, and Discourse Annotation, The Process of Building Treebanks, application of Treebanks.<br>• Conclusion of the Unit |

| 5 | **Statistical Techniques in Natural Language Processing** |
|---|---|
| | • Introduction of Unit<br>• Introduction to statistics and its importance in natural language processing, general linear model, binary linear classification, one versus all method for multi-category classification, maximum likelihood estimation in parameter estimation in linear classification techniques, concepts of generative and discriminative models, introduction to sequence prediction model and its application in natural language processing.<br>• Conclusion of the Unit |

**E. RECOMMENDED STUDY MATERIAL**

| Sr. No | Reference Book | Author | Publication |
|---|---|---|---|
| 1 | Hand Book of Natural Language Processing, | Nitin Indurkhyafred J. Damerau | CRC Press |
| 2 | Mining Text Data | Charu C. Aggarwal, Cheng Xiang Zhai | Springer Publication |
| 3 | Text Mining Classification, Clustering, and Applications | Ashok N. Srivastava, Mehran Sahami | CRC Press |

**Code: BAMCCE6102 Deep Learning Using SAS® Software 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Define and understand deep learning.
- Build models using deep learning techniques.
- Apply models to score (inference) new data.
- Modify data for better analysis results.
- Search the hyperparameter space of a deep learning model.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

**C. OUTLINE OF THE COURSE**

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Deep Learning** | 08 |
| 2. | **Convolutional Neural Networks** | 08 |
| 3. | **Recurrent Neural Networks** | 08 |
| 4. | **Tuning a Neural Network** | 09 |
| 5. | **Additional Topics** | 07 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Deep Learning** |
| | • Introduction to neural networks.<br>• Introduction to deep learning.<br>• ADAM optimization.<br>• Dropout.<br>• Batch normalization.<br>• Autoencoders<br>• Building level-specific autoencoders (self-study) |
| 2. | **Convolutional Neural Networks** |
| | • Applications.<br>• Input layers.<br>• Convolutional layers.<br>• Padding.<br>• Pooling layers.<br>• Traditional layers<br>• Types of skip-layer connections.<br>• Image pre-processing and data enrichment.<br>• Training convolutional neural networks |
| 3. | **Recurrent Neural Networks** |
| | • Introduction.<br>• Recurrent neural networks overview.<br>• Sub-types of recurrent neural networks.<br>• Time series analysis using recurrent neural networks.<br>• Sentiment analysis using recurrent neural networks |
| 4. | **Tuning a Neural Network** |
| | • Selecting hyperparameters.<br>• Hyperband. |
| 5. | **Additional Topics** |
| | • Types of transfer learning.<br>• Transfer learning basics.<br>• Transfer learning strategies.<br>• Transfer learning with unsupervised pretraining.<br>• Customizations with FCMP. |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Professional Nosql | Shashank Tiwari | | Wrox |
| 2. | MongoDB in Action | KYLE BANKER PETER | Second Edition | Manning |
| **Reference Book** | | | | |
| 3. | NoSQL for Dummies, Adam Fowler, John Wiley & Sons, Inc | | | |
| 4. | NoSQL Distilled, Pramod J. Sadalage & Martin Fowler, Pearson Education, Inc. | | | |
| 5. | Making Sense of NoSQL, Dan McCreary& Ann Kelly, Manning Shelter Island | | | |
| **Online Resources** | | | | |
| 6. | https://www.javatpoint.com/nosql-databases | | | |
| 7. | https://www.tutorialspoint.com/mongodb/index.htm | | | |

| Code:BAMCCE6201 | Natural Language Processing Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| | **Exercise – 1**<br><br>a) Tokenize the sentence into words for the further analysis (using Python Function)<br>b) Normalize the sentence to eliminate the unwanted punctuation, converting into lower case or upper case of the entire document, expanding abbreviation, numbers into words and canonicalization.<br>c) Apply similarity measures using Jaccard's Coefficient or Tanimoto coefficient<br>d) Apply similarity measures using the Smith Waterman distance<br><br>**Exercise – 2**<br><br>a) For the given data what is the maximum number of words used. Get the output for the frequently occurred word in the given data?<br>b) Visualize the given text data with appropriate visual techniques?<br>c) Get the word cloud for the given data and interpret where the management need to give highest attention to get the better income? |
| **Part B** | |
| | **Exercise – 3**<br><br>a) Develop a back-off mechanism for Maximum Likelihood Estimate (MLE)<br>b) Apply interpolation on data to get mix and match<br><br>**Exercise - 4**<br><br>a) Perform the sentiment analysis, classifying comments using a Bayesian analysis.<br>b) Using ggplot2, plot the words which occurs more than 50 times.<br>c) Come out with word cloud and interpret the same. |

**B. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | CloudComputing: Concepts, Technology & Architecture | Zaigham Mahmood, Ricardo Puttini, and Thomas Erl | 20013 | Pearson Education |
| **Reference Book** | | | | |
| 1. | "Cloud Computing For Dummies" by Judith Hurwitz | | | |
| **Online Resources** | | | | |
| 1. | **https://www.geeksforgeeks.org/kubernetes-tutorial/** | | | |
| 2. | https://www.javatpoint.com/cloud-computing | | | |

| Code:BAMCCE6202 | Deep Learning & Computer Vision lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**Course Outcome:-**

Students will be able:

- Model language Ngram andn POS Taging.
- Understand HMM
- develop appication for speach recognization
- Understand word net
- Understand pixel and camera ready concept

**C. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Introduction to NLP Libraries |
| **2** | Implement Dropout. and Batch normalization |
| **3** | Write Program to implement Image pre-processing and data enrichment |
| **4** | Write a program to implement diffrent learning stratagies |
| **5** | Implement Semantic segmentation |
| **6** | Implement diffrent image classification algorithms |
| **7** | Make a small aplication on object detection |
| **8** | Implement Syntactic parsing: CKY parsing; |

D. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | PROFESSIONAL NoSQL | Shashank Tiwari | | Wrox |
| 2. | MongoDB in Action | KYLE BANKER PETER | Second Edition | Manning |
| **Reference Book** | | | | |
| 1. | NoSQLfor Dummies, AdamFowler, JohnWiley&Sons,Inc | | | |
| 2. | NoSQLDistilled, PramodJ.Sadalage&Martin Fowler, PearsonEducation, Inc. | | | |
| 3. | MakingSenseof NoSQL, DanMcCreary& Ann Kelly, ManningShelterIsland | | | |
| 4. | NoSQLforMereMortals, DanSullivan, PearsonEducation | | | |

| Online Resources | |
|---|---|
| 1. | https://www.javatpoint.com/nosql-databases |
| 2. | https://www.tutorialspoint.com/mongodb/index.htm |

| Code: BUACHU6223 | Professional Skills-II | 1 Credit | [LTP: 0-0-2] |
|---|---|---|---|

**COURSE OUTCOMES**

Students would be able to:

CO1: Learn how to update and manage the experience, education, and skills & expertise sections on social media & formulate appropriate updates as a means to promote business activities.

CO2: Understand how to leverage grammar and formatting in formal documents & demonstrate how to follow the stages of the writing process .

CO3: Evaluate presentation's weak spots and areas for improvement & learn, practice and acquire the skills necessary to deliver effective presentation with clarity and impact.

CO4: Evaluate basic factors such as personal skills & abilities, career fields, willingness to learn and strengthen the chances to get desirable jobs.

CO5: Understand negotiation and team skills dynamics and how to prepare for uncertainty & learn to craft agile strategy and be quick on your feet in changing circumstances.

| UNIT NO. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Personal Branding** | 2 |
| 2 | **Professional Writing-II** | 8 |
| 3 | **Presentation Skills: Professional Setting** | 2 |
| 4 | **Job Interview & Group Discussion: Preparation by Mock Practice** | 4 |
| 5 | **Negotiation Skills, Team Management & Professional Awareness** | 8 |

| LIST OF LABS | |
|---|---|
| 1. | Personal Branding: Its best practices |
| 2. | Professional Writing II: Abstract Writing, Statement of purpose and other formal documents |
| 3. | Expanding Professional Vocabulary |
| 4. | Resume Building-II: Revising & Updating |
| 5. | E-Learning & E-Content Development-II |
| 6. | Presentation Skills in Professional Setting |
| 7. | Job Interviews II: Preparation and Presentation for Mock Interviews |
| 8. | Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics |
| 9. | Negotiation Skills & and Conflict Resolution-II |
| 10. | Change and Transition Management |
| 11. | Team Building Strategies: Project Management |
| 12. | Career Awareness & Productive Mindset |

| Code:BULCSE6201 | Skill Enhancement General Courses-VI | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**Course Outcome:-**

Students will be able to:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

| LIST OF ACTIVITIES | |
|---|---|
| 1 | Work & Wages, Ratio & Proportions |
| 2 | Effective Communication and Managing Conflict, Story telling |
| 3 | Heights & Distances, Probability |
| 4 | Comprehension & Para Jumble |
| 5 | Written Communication, Behavioral Interview Skills |
| 6 | Effective Presentation skills, How to become more approachable |
| 7 | Odd one out, Order & Ranking |
| 8 | Deductive Reasoning, Divergent Thinking |
| 9 | How to brainstorm effectively, Mirror & Water images |
| 10 | Mind Mapping, Closing deals |
| 11 | Project Management, Team Management |
| 12 | Emotion Management, Delivering constructive feedback |

t t

**Code: BCECCE7101 Data Mining Techniques and Application 3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Ability to understand the types of the data to be mined and present a general classification of tasks.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns, measurement and rule based data from large amounts of data.
- Choose and employ suitable data mining algorithms to build analytical applications.
- Comprehend the organization of data in the form of data warehouse and advanced concepts.

**A. CO-PO Mapping**

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

**B. CO-PSO Mapping**

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to Data Mining** | 07 |
| 2. | **Classification** | 08 |
| 3. | **Cluster Analysis** | 07 |
| 4. | **Association Rule Mining and Visualization** | 08 |
| 5. | **Data warehousing** | 07 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Data Mining** |
| | • Introduction to Data Mining<br>• Data Mining Tasks<br>• Components of Data Mining Algorithms<br>• Data Mining supporting Techniques<br>• Major Issues in Data Mining<br>• Measurement and Data<br>• Data Preprocessing<br>• Data sets<br>• Conclusion of Unit |
| 2. | **Classification** |
| | • Introduction to Classification<br>• Basic Concepts<br>• Decision Tree induction<br>• Bayes Classification Methods<br>• Rule Based Classification<br>• Model Evaluation and Selection<br>• Techniques to Improve Classification Accuracy<br>• Classification: Advanced concepts<br>• Bayesian Belief Networks<br>• Classification by Back Propagation<br>• Support Vector Machine<br>• Classification using frequent patterns.<br>• Conclusion of Unit |
| 3. | **Cluster Analysis** |
| | • Introduction to Cluster Analysis<br>• Basic concepts and Methods<br>• Partitioning methods<br>• Hierarchical methods<br>• Density Based Methods<br>• Grid Based Methods<br>• Evaluation of Clustering<br>• Advanced Cluster Analysis: Probabilistic model based clustering, Clustering High Dimensional Data, Clustering Graph and Network Data, Clustering with Constraints.<br>• Conclusion of Unit |

| | |
|---|---|
| **4.** | **Association Rule Mining and Visualization** |
| | • Introduction to Association Rule Mining<br>• Large Item sets<br>• Basic Algorithms<br>• Parallel and Distributed Algorithms<br>• Comparing Approaches<br>• Incremental Rules<br>• Advanced Association Rule Techniques<br>• Measuring the Quality of Rules<br>• Introduction to Visualization<br>• Visualization of Multidimensional Data<br>• Diagrams for Multidimensional visualization<br>• Visual Data Mining<br>• Data Mining Applications<br>• Case Study: WEKA.<br>• Conclusion of Unit |
| **5.** | **Data warehousing** |
| | • Introduction to Data warehousing<br>• Data warehousing components<br>• Multi dimensional data model<br>• Data warehouse architecture<br>• Data warehouse implementation<br>• Mapping the data warehouse to multiprocessor architecture<br>• OLAP<br>• Need<br>• Categorization of OLAP Tools<br>• Introduction to Data Cube<br>• Data Cube Technology: Efficient Methods for Data Cube Computation<br>• Exploration and Discovery in Multidimensional Databases<br>• Conclusion of Unit |

**E. RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Data Mining Concepts and Techniques | Jiawei Han and Micheline Kamber | Third Edition | Elsevier |
| 2. | Principles of Data Mining (Adaptive Computation and Machine Learning) | David J. Hand, Heikki Mannila and Padhraic Smyth | Latest | A Bradford Book |
| 3. | Data Mining: Introductory and Advanced Topics | Margaret H Dunham | Latest | Pearson |
| **Reference Book** | | | | |
| 4. | Data Mining Concepts and Techniques, Author Jiawei Han and Micheline Kamber, August 2000 | | | |
| 5. | Principles of Data Mining (Adaptive Computation and Machine Learning), David J. Hand, Heikki Mannila and Padhraic Smyth | | | |
| 6. | Data Mining: Introductory and Advanced Topics, Margaret H Dunham,Pearson | | | |
| **Online Resources** | | | | |
| 7. | https://www.educba.com/data-mining-concepts-and-techniques/ | | | |

| | |
|---|---|
| 8. | https://nptel.ac.in/courses/106105174 |
| 9. | https://onlinecourses.swayam2.ac.in/cec20_cs12/preview |

**Code: BCECCE7201 Data Mining Techniques and Application Lab 1 Credit [LTP: 0-0-2]**

**Course Outcome: -**
Students will be able to:

- Know how to implement and demonstrate algorithms in WEKA
- Implement the concepts of data preprocessing & item construction in WEKA.
- Comprehend intermediate code generation, implement association rule process in WEKA.
- Implement classification and clustering algorithms in WEKA.
- Learn the concepts, global data flow analysis and efficient algorithm Visualize data in WEKA.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | Demonstration of preprocessing on dataset student.arff |
| **2** | Demonstration of preprocessing on dataset labor.arff |
| **3** | Demonstration of Association rule process on dataset contactlenses. arff using aprioris algorithm |
| **4** | Demonstration of Association rule process on dataset test.arff using apriori algorithm |
| **5** | Demonstration of classification rule process on dataset student.arff using j48 Algorithm |
| **6** | Demonstration of classification rule process on dataset employee.arff using j48 algorithm |
| **7** | Demonstration of classification rule process on dataset employee.arff using id3 algorithm |
| **8** | Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm |
| **9** | Demonstration of clustering rule process on dataset iris.arff using simple k-means |
| **10** | Demonstration of clustering rule process on dataset student.arff using simple kmeans |
| **11** | Usage of WEKA for visualization of data set student.arff. |
| **12** | Usage of WEKA for visualization of data set employee.arff. |

B. **RECOMMENDED STUDY MATERIAL**

| **S. No** | **Text Books:** | **Author** | **Edition** | **Publication** |
|---|---|---|---|---|
| 1. | Data Mining Concepts and Techniques | Jiawei Han and Micheline Kamber | Third Edition | Elsevier |
| 2. | Principles of Data Mining (Adaptive Computation and Machine Learning) | David J. Hand, Heikki Mannila and Padhraic Smyth | Latest | Springer |
| 3. | Data Mining: Introductory and Advanced Topics | Margaret H Dunham | Latest | Pearson Education, 2006 |
| **Reference Book** | | | | |
| 4. | Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber,Third Edition Elsevier | | | |
| 5. | Principles of Data Mining (Adaptive Computation and Machine Learning), David J. Hand, Heikki Mannila and Padhraic Smyth | | | |

| | |
|---|---|
| 6. | Data Mining: Introductory and Advanced Topics, Margaret H Dunham Latest,Pearson Education, 2006 |
| **Online Resources** | |
| 7. | https://www.javatpoint.com/data-mining |
| 8. | https://nptel.ac.in/courses/106105174 |

| Code:BCECCE7202 | Internet of Things(IoT) lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**Course Outcome: -**
Students will be able to:

- Understand the fundamental concepts and principles of the Internet of Things (IoT)
- Gain practical skills in developing IoT applications using microcontrollers, sensors, and communication protocols
- Learn to design and implement IoT systems for various real-world scenarios, such as home automation, agriculture, and environmental monitoring.
- Develop proficiency in integrating IoT devices with cloud platforms and mobile applications for data collection, analysis, and visualization.
- Enhance problem-solving and critical thinking abilities through hands-on experimentation and troubleshooting in IoT projects.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| **1** | LED Control via Smartphone App<br>Use an Arduino or Raspberry Pi to control an LED using a smartphone app over Wi-Fi or Bluetooth |
| **2** | Temperature and Humidity Monitoring<br>Build a temperature and humidity sensor using a microcontroller and display the data on an LCD or send it to a cloud platform |
| **3** | Home Automation System<br>Create a smart home automation system using IoT devices to control lights, appliances, and security systems. |
| **4** | Smart Irrigation System<br>Develop an IoT-based system that monitors soil moisture and weather conditions to automate the irrigation process. |
| **5** | Smart Health Monitoring<br>Create a wearable IoT device to monitor vital signs like heart rate, blood pressure, and temperature, and transmit the data to a mobile app or cloud platform. |
| **6** | Smart Parking System<br>Build a system that uses sensors to detect parking spot availability and notifies drivers via a mobile app or LED displays. |
| **7** | Air Quality Monitoring<br>Design an IoT-based air quality monitoring system using gas sensors and display real-time data on a web dashboard. |
| **8** | Waste Management System<br>Develop a smart waste management system that monitors garbage levels in bins and notifies waste collection teams when they need emptying. |
| **9** | Smart Energy Management<br>Create an energy management system that monitors and controls energy consumption in buildings using IoT devices and data analytics. |
| **10** | Traffic Monitoring and Control System<br>Develop a system that uses IoT devices to monitor traffic flow, control traffic signals, and provide real-time traffic updates to drivers. |

# Minor Stream Courses

**Code:BCEBAM7101** **Optimization Concepts for Data Science and Artificial Intelligence** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Identify and formulate appropriate approaches to solving various linear, mixed-integer linear, and nonlinear optimization problems.
- Create optimization models commonly used in industry.
- Solve optimization problems using the OPTMODEL procedure in SAS.

### A. CO-PO Mapping

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

### B. CO-PSO Mapping

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Introduction to Mathematical Optimization** | 07 |
| 2 | **Linear Programming** | 08 |
| 3 | **Nonlinear Programming** | 07 |
| 4 | **Integer and Mixed-Integer Linear Programming** | 08 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Mathematical Optimization** |
| | • Introduction.<br>• A simple example.<br>• The OPTMODEL procedure. |
| 2. | **Linear Programming** |
| | • Introduction to linear programming.<br>• Formulating and solving linear programming problems using the OPTMODEL procedure.<br>• Using index sets and arrays in the OPTMODEL procedure.<br>• Dual values and reduced costs in the simplex method (self-study).<br>• Applied data envelopment analysis (self-study)<br>• Reading SAS data sets (self-study). |
| 3. | **Nonlinear Programming** |
| | • Introduction to nonlinear programming.<br>• Solving nonlinear programming problems using the OPTMODEL procedure. |
| 4. | **Integer and Mixed-Integer Linear Programming** |
| | • Introduction to integer and mixed-integer linear programming.<br>• Solving integer and mixed-integer linear programming problems using PROC OPTMODEL |

## E. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | The Complete Reference Linux | | Seventh Edition | Mc graw hill |
| 2. | Linux Bible | Christopher Negus | Kindle Edition | Wiley |
| **Reference Book** | | | | |
| 3. | Windows 10 Portable, Wiley, Paul Mac Fedrics. | | | |
| 4. | Desktop OS for Expert, Sayan Banerjee and Swati Goel | | | |
| **Online Resources** | | | | |
| 5 | https://www.bu.edu/tech/files/2018/05/2018-Summer-Tutorial-Intro-to-Linux.pdf | | | |
| 6 | https://www.youtube.com/watch?v=67keaaWOKzE | | | |
| 7 | https://www.coursera.org/os | | | |

**Code:BCEBAM7102** **Data Handling & Visualization** **3 Credits [LTP: 3-0-0]**

**COURSE OUTCOME**

Students will be able to:

- Apply data preprocessing techniques
- Create data visualization using various types of charts
- Apply visualization techniques for various data analytics tasks
- Design information dashboard and finding data pattern through visualization.
- Implement Pattern Recognition techniques in real world application

### A. CO-PO Mapping

| COs and POs | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | PO-9 | PO-10 | PO-11 | PO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |
| CO-2 | 3 | 2 | 1 | 2 | — | — | — | — | — | — | — | — |
| CO-3 | 2 | 3 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-4 | 2 | 2 | 2 | 1 | — | — | — | — | — | — | — | — |
| CO-5 | 2 | 3 | 1 | 1 | — | — | — | — | — | — | — | — |

### B. CO-PSO Mapping

| COs and PSOs | PSO-1 | PSO-2 | PSO-3 |
|---|---|---|---|
| CO-1 | 2 | — | — |
| CO-2 | 2 | — | — |
| CO-3 | 1 | — | — |
| CO-4 | 2 | — | — |
| CO-5 | 2 | — | — |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of The Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | An overview of Data Visualization | 07 |
| 2 | Discussion of workflow Exploratory Visualization | 08 |
| 3 | Visual Analytics & Dashboard Developments | 07 |
| 4 | Working with stakeholders and creating analytical products | 08 |
| 5 | Pattern Recognition | 07 |

### D.DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **An overview of Data Visualization** |
| | • Introduction to Effective Software Testing,<br>• "What Tableau can and cannot do well"<br>• Introduction to SVG and CSS<br>• Debug and troubleshoot installation and configuration of the software<br>• Introduce the final project<br>• Configuring Data Environment<br>• Connecting to Data<br>• Metrics vs dimensions<br>• Data types and defaults<br>• Aliases and names<br>• Data Visualization Concept<br>• Conclusion of the Unit |
| **2.** | **Discussion of workflow Exploratory Visualization** |
| | • Introduction of Unit<br>• Data Joins<br>• Best Practices<br>• Creating visualizations with Tableau<br>• Sorting, Top N, bottom N<br>• Filtering<br>• Maps<br>• Conclusion of Unit |
| **3.** | **Visual Analytics & Dashboard Developments** |
| | • Introduction of Unit<br>• Optimal visualization types<br>• Binning values<br>• Calculated fields<br>• Table calculations<br>• Level of Detail calculations<br>• Dashboard design principles<br>• Dashboard interactivity<br>• Conclusion of Unit . |
| **4.** | **Working with stakeholders and creating analytical products** |
| | • Introduction of Stakeholders<br>• Stakeholder categories<br>• Receiving feedback<br>• Performing design iterations<br>• Conclusion of Unit. |
| **5.** | **Pattern Recognition** |
| | • Introduction to Pattern Recognition, Feature Detection, Classification.<br>• Review of Probability Theory, Conditional Probability and Bayes Rule.<br>• Random Vectors, Expectation, Correlation, Covariance.<br>• Review of Linear Algebra, Linear Transformations.<br>• Data Exploration (Like, Outlier Detection), Data Explanation (Like, Storytelling) .<br>• Conclusion of Unit |

## E.RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Effective Data Storytelling: How to Drive Change with Data, Narrative, and Visuals | Brent Dykes | 2018 | |
| 2. | Effective Data Visualization: The Right Chart for the Right Data | Stephanie D. H. Evergreen | 2021 | Evergreen Data & Evaluation, LLC |
| 3. | The Visual Display Of Quantitative Information | Edward R.Tufte | 2018 | Amazon |
| **Reference Book** | | | | |
| 1. | "Information Dashboard Design: Displaying Data for At-a-glance Monitoring" by Stephen Few,O'Rellay | | | |
| 2. | "The Accidental Analyst: Show Your Data Who's Boss" by Eileen and Stephen McDaniel, O'Rellay | | | |
| **Online Resources** | | | | |
| 1. | https://towardsdatascience.com/visualize-hierarchical-data-using-plotly-and-datapane-7e5abe2686e1 | | | |
| 2. | https://www.idvbook.com/index.html%3Fp=44.html | | | |
| 3. | https://www.youtube.com/watch?v=leXt9btuyEY | | | |
| 4. | https://mschermann.github.io/data_viz_reader/patterns.html | | | |

| Code:BAMCCE7201 | Forecasting Using Model Studio in SAS® Viya® Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

**Course Outcome: -**

Students will be able to:

- Automatically create and fit custom forecast models using structured analytic workflows or pipelines.
- Visualize modeling data using attribute variables.
- Refine forecast models to improve forecast accuracy.
- Apply overrides-generated forecasts.
- Generate forecast data sets for deployment.

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | Introduction and Data Visualization: Creating a forecasting project and loading the data |
| 2 | Visualizing the modeling data using attribute variables |
| 3 | Pipeline Essentials: Basic modeling with pipelines |
| 4 | Pipeline templates and pipeline comparison |
| 5 | Accuracy statistics and forecast model selection |
| 6 | Families of models supported. |
| 7 | Hierarchical Forecasting |
| 8 | Time series data creation and forecast reconciliation |
| 9 | Combined models |
| 10 | Honest assessment |
| 11 | Post-forecasting Functionality: ▪ Overrides |
| 12 | Exporting generated tables |
| 13 | Adjustments to statistical forecasting |
| 14 | In-Line Code Access and Overview (Appendix): Code overview |
| 15 | Accommodating Event Variables in a Model Studio Project (Appendix) |
| 16 | Adding event variables in the TSMODEL procedure |

B. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | The Complete Reference Linux | | Seventh Edition | Mc graw hill |

| | | | | |
|---|---|---|---|---|
| 2. | Linux Bible | Christopher Negus | Kindle Edition | Wiley |
| **Reference Book** | | | | |
| 1. | Windows 10 Portable, Wiley, Paul Mac Fedrics. | | | |
| 2. | Desktop OS for Expert, Sayan Banerjee and Swati Goel | | | |
| **Online Resources** | | | | |
| 1. | **https://www.youtube.com/watch?v=BGjTboXjH28** | | | |
| 2. | **https://www.youtube.com/watch?v=g5d0dfq_Ew8** | | | |

**Code:BAMCCE7202** **Data Handling Visualization lab** **1 Credits [LTP: 0-0-2]**

**Course Outcome: -**

Students will be able to:

- Apply fundamental data analytics techniques, using spreadsheet and database tools, to prepare, interpret on datasets.
- Identify the principles of visual perception.
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks

**A. LIST OF EXPERIMENTS:**

1

Perform the Visualization of Spread sheet Models according to given requirement.

1. For the given data set that contains immigration details to Canada from 1980 to 2013,
   - Create an area plot for top 6 immigrant countries from 1990 to 2013
   - Create and year-wise immigrant bar chart from India to Canada during the period of 1980 to 2013.
   - Create a box plot for Indian, Phillip in and China immigrants.
   - Show the total no. of immigrants from India and France countries using Area Chart and Pie chart.
   - Create a scatter Histogram for the immigrants from Fiji and Singapore in the year 2013.

   LinkforDataSet-
   https://www.un.org/en/development/desa/population/migration/data/empirical2/migrationflows.asp

2. Visualize the given Placement Data Full Class dataset that contains details about Campus Recruitment using the below techniques for appropriate dimensions and differentiate between the two techniques:
   - Histogram and Bar Chart [For histogram let no. of bins=10]
   - Facet Plot and Pair Plot
   - Area Chart and Pie Chart [For yes or no data]

2

RDBMS Connectivity using Python

Find out output of the joint operation applied to the company database.

Apply inner join type to the following queries; apart from this apply other joins type to the first question.

- List the name of all employees who works for the research department.
- For every project located at 'Stafford' list the project number, the controlling Departmentt number and Departmentt manages last name.
- Find the name of all employees who works on the projects controlled by Dno=4.
- Make the list of project numbers for projects that involve an employee whose last name is' Jennifer' as a worker or as a manager of the dept that controls the project.
- List the name of the employees who have no dependents.
- List the name of manager that have at least one dependent.

3

Visualization of Semi-Structured Data

1. Create a dictionary for the below data and convert the data into JSON.

| S.NO | Name | Department | GPA | Future Preference |
|---|---|---|---|---|
| **1** | Amy | CSE | 8.7 | Placements |
| **2** | Rebekah | ECE | 9.2 | Higher Education |
| **3** | David | CSE | 5.6 | Higher Education |
| **4** | Sophia | CSE | 6.8 | Placements |
| **5** | Lucas | ECE | 7.5 | Placements |
| **6** | Andrew | CSE | 8.9 | Higher Education |
| **7** | Evan | CSE | 7.9 | Placements |
| **8** | Rose | CSE | 8.7 | Higher Education |
| **9** | Luis | ECE | 7.2 | Higher Education |

| | | | | | |
|---|---|---|---|---|---|
| | **10** | Blake | ECE | 6.8 | Higher Education |
| | **11** | Finn | CSE | 7.2 | Placements |
| | **12** | Alan | ECE | 8.7 | Placements |
| | **13** | Olivia | ECE | 6.8 | Higher Education |
| | **14** | Isabella | CSE | 8.7 | Placements |
| | **15** | Scarlett | ECE | 6.8 | Higher Education |

using dump()method from JSON package.

i. Plot a graph showing the difference in Future Preferences of the students.
ii. Visualize the student's statistics based on the feature "Department".
iii. Plot a pie chart for the feature GPA.

2. For the below given data set which contains world population in json format:
https://query.data.world/s/uvvfp4usm2q4mlapbqtoi2stgunwda

iv. Read the data using pandas in column orient.
v. Using appropriate plotting technique visualize the given data on the basis of population feature.

| | |
|---|---|
| 4 | Introduction to Tableau and Aggregation Methods in Any Data Visualization tool of your choice.<br>Connect the given Bus Safety dataset to Tableau and perform the below tasks on separate sheets.<br>i. Go to meta-data of the data set and change the column name form 'Date Of Incident' to 'Date' and 'Bus Garage' to 'Garage'.<br>ii. Visualize the no. of Incidents by different Operators and explore various possible charts.<br>iii. Show a pie chart depicting the age categories as Adult, Child, Elderly and Unknown and no. of incidents in each category.<br>iv. Show the statistics of Route No.'s in purple color Bar Chart.<br>v. Create a chart for 'Borough' feature depicting the total count of each and then sort it in ascending order.<br>vi. Depict the no. of incidents under the eight Incident Event Types for each of the Boroughs in the form of horizontal bar chart. |
| 5 | Visual Encodings and Basic Dash boards in Any Data Visualization tool of your choice<br><br>For the given dataset FIFA.csv that contains data about various football players, perform the following tasks on separate sheets:<br>i. After connecting the data use the data interpreter and clean the data.<br>ii. Create a horizontal bar chart to depict the International Reputation of various nations on an avg.<br>iii. Check if there is any relation between wage and position(left/right). If yes, describe the relation.<br>iv. Plot a bar chart against Avg. Heading Accuracy and Body Type. Find out which body type has highest and least accuracy.<br>v. Create a yellow colored Tree Chart to depict the total penalties of each nation and thus determine the highest and lowest.<br>vi. Using the above sheets create a dashboard and write an analysis report of what insights can be drawn from this. |
| 6 | Interactive Plots in Python<br>Using the in-built "Car Crashes" dataset from seaborn library perform the below tasks in order to depict interactive plots.<br>i. Create a sub-dataset df that contains 'total', 'speeding', 'alcohol' columns only.<br>ii. Visualize an interactive bar plot for df.<br>iii. Using bar iplot, display the mean of all columns in the original dataset.<br>iv. Visualize a scatter matrix plot for the dataset. (The scatter matrix plot is basically a set of all the scatter plots for numeric columns in your dataset)<br>v. Depict an interactive box plot for df. |

| | |
|---|---|
| | vi. Show a histogram plot for df interactively.<br>vii. Visualize 3D iplot for the data and give your insights so as to why and when should 3D visualization be used. |
| 7 | Hierarchical and Topographical Data Visualizations in Any Data Visualization tool of your choice.<br><br>Using the in-built data set from following link :<br>https://www.bls.gov/cpi/tables/relative-importance/home.htm#Archived%20Relative%20Importance%20Data<br>Find the suitable answer of following<br><br>i. Develop a sunburst pie chart to visualize all items.<br>ii. Create a tree map graph to display data in rectangular box<br>iii. Display the data in hierarchical format using shankey diagram. |
| 8 | Calendar Heat maps Data Visualizations in Python<br>i. Write a Pandas program to create a heat map (rectangular data as a color-encoded matrix) for comparison of the top 10 years in which the UFO was sighted vs each Month.<br>ii. Load the dataset from "flight_dealy.csv" and create a heat map to show relationship between various fields of dataset. |
| 9 | Time Series Data Visualization in Python<br>Collect the dataset from link<br>https://github.com/Neelu-Tiwari/dataset/blob/main/stock_data.csv and perform the following task.<br>i. Plot the changes that occurred in data over time.<br>ii. Create a bar plot of month data for 2016 and 2017.<br>iii. Perform the more practices from<br>a. https://learnche.org/pid/data-visualization/data-visualization-exercises<br>b. https://www.r-exercises.com/2017/04/10/forecasting-time-series-exploration-exercises-part-1/ |
| 10 | Imagine that you work at one location of a retail department store chain. You're curious to see how the proportion of sales by product category at your particular store differs from the average of sales distribution numbers across all locations. Download the dataset from<br><br>https://docs.google.com/spreadsheets/d/1VDG-ZpkkRaAituejvzIJ1Ky24LMpQfTN/edit#gid=416232713. |
| 11 | Select a member of the MIT aesthetics and computation research group (http://acg.media.mit.edu/). Briefly discuss that person's work and provide a review of the potential for that technique to help in information visualization (amount of information communicated vs. amount of aesthetics). |
| 12 | Given a census data set, describe three or more ways you might order the dimensions prior to visualization. What are the strengths and weaknesses of each? You may use the US County Census data set available on the book web site or at the http://www.openindicators.org web page. |

**RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Effective Data Storytelling: How to Drive Change with Data, Narrative, and Visuals | Brent Dykes | 2018 | |
| 2. | Effective Data Visualization: The Right Chart for the Right Data | Stephanie D. H. Evergreen | 2021 | Evergreen Data & Evaluation, LLC |
| 3. | The Visual Display Of Quantitative Information | Edward R.Tufte | 2018 | Amazon |
| **Reference Book** | | | | |

| | |
|---|---|
| 1. | "Information Dashboard Design: Displaying Data for At-a-glance Monitoring" by Stephen Few,O'Rellay |
| 2. | "The Accidental Analyst: Show Your Data Who's Boss" by Eileen and Stephen McDaniel, O'Rellay |
| **Online Resources** | |
| 1. | https://towardsdatascience.com/visualize-hierarchical-data-using-plotly-and-datapane-7e5abe2686e1 |
| 2. | https://www.idvbook.com/index.html%3Fp=44.html |

| Code:BUACHU7226 | Comparative Literature Lab | 1 Credits [LTP: 0-0-2] |
|---|---|---|

## COURSE OUTCOMES

Students would be able to:

CO1: Students should be able to distinguish between the writing structure used for a quantitative study and one used for a qualitative study
CO2: Build up a good command over the conventions with a good APA style for scholarly writing.
CO3: Define problems while writing research papers and citation methods.
CO4: Understand, analyze and effectively use various citation methods according to research patterns.
CO5: Develop their interest in designing original research drafts

| Unit No.. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1** | **India and Vedic Tradition** | **8** |
| **2** | **Bengal and Indian Literature** | **2** |
| **3** | **Asian Literature** | **4** |
| **4** | **East and West Tradition** | **2** |
| **5** | **Translation and Adaptation** | **8** |

| LIST OF LABS | |
|---|---|
| 1 | *Natya Shastra; Bharat Muni Godan – Premchand* |
| 2 | Short Stories: Voikom Muhammod Basheer (Selected) Sadat Hasan Manto(Selected) |
| 3 | Novels: Chandrashekhar – Bankimchandra Chattopadhyay, Bener Meye – Haraprasad Shastri, Bindur Chele – Sharatchandra Chattopadhyay |
| 4 | Translations of Ramayana and Mahabharata in major Indian Languages |
| 5 | *Madhobi (Manipuri) – Kamal Singh* |
| 6 | The Moth-Eaten Howdah of a Tusker (Assamese) |
| 7 | *Selina Hossain – Nil Mayurer Joubon* |
| 8 | Tempest, Shakuntala and Rabindranath |
| 9 | W.B. Yeats and Indian Philosophy |
| 10 | T.S. Eliot, Romain Rolland and India |
| 11 | Kipling's "Kim", Rabindranath's "Gora", and Forster's "A Passage to India" |
| 12 | Amrita Pritam : Punjabi and English Translation |

| Code:BULCSE7201 | Skill Enhancement Technical Courses-I Lab | 2 Credits [LTP: 2-0-0] |
|---|---|---|

**A. LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1. | **Introduction to Competitive Programming**<br>Overview of competitive programming and its significance in the IT industry<br><br>Understanding the common programming contest platforms and their features (e.g., Codeforces, Topcoder, HackerRank)<br><br>Introduction to algorithmic problem-solving techniques and strategies<br><br>Familiarization with programming languages commonly used in competitive programming (e.g., C++, Java) Basic input/output operations and handling test cases |
| 2. | **Data Structures**<br>Review of fundamental data structures (arrays, linked lists, stacks, queues)<br><br>Advanced data structures: trees (binary trees, binary search trees, heaps), graphs (representation, traversal algorithms), and hash tables<br><br>Analyzing time and space complexities of data structures and their operations<br>Implementing data structures from scratch and utilizing built-in libraries |
| 3. | **Algorithms and Problem Solving**<br>Understanding algorithmic paradigms: greedy, divide and conquer, dynamic programming.<br><br>Sorting and searching algorithms (e.g., quicksort, mergesort, binary search)<br>Graph algorithms: breadth-first search (BFS), depth-first search (DFS), shortest paths, minimum spanning trees.<br><br>Dynamic programming: principles, memoization, tabulation<br><br>Solving practice problems to reinforce algorithmic thinking |
| 4. | **Advanced Topics**<br>String manipulation algorithms (pattern matching, suffix trees, tries)<br><br>Advanced graph algorithms: topological sorting, strongly connected components, network flow.<br><br>Computational geometry: convex hull, line intersection, closest pair of points.<br><br>Number theory: prime numbers, modular arithmetic, Euclidean algorithm.<br><br>Utilizing advanced algorithms to solve competitive programming problems |
| 5. | **Contest Strategies and Optimization**<br>Time management techniques for competitive programming contests<br><br>Understanding problem statements and devising efficient solutions<br><br>Applying code optimization techniques for faster execution and reduced memory usage<br><br>Debugging and handling common errors in competitive programming<br><br>Participating in mock contests and real-time coding competitions |

**Note**: This syllabus provides a broad outline for a competitive programming course. It is recommended to allocate sufficient time for each unit and incorporate regular practice sessions, coding exercises, and mock contests to enhance problem-solving skills and familiarity with the competitive programming environment.

**Books** :

"Competitive Programming 3" by Steven Halim and Felix Halim.
"Introduction to the Design and Analysis of Algorithms" by Anany Levitin
"Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles" by Narasimha Karumanchi
"Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
"Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology" by Dan Gusfield
"Computational Geometry: Algorithms and Applications" by Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars
"Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology" by Dan Gusfield
"Computational Geometry: Algorithms and Applications" by Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars
"Competitive Programmer's Handbook" by Antti Laaksonen
"Competitive Programming: The New Lower Bound of Programming Contests" by Hasan Jaddouh

**Online Learning Platform:**

Codeforces: https://codeforces.com/
Topcoder: https://www.topcoder.com/
HackerRank: https://www.hackerrank.com/
LeetCode: https://leetcode.com/
Codeforces: https://codeforces.com/
GeeksforGeeks: https://www.geeksforgeeks.org/
Brilliant: https://brilliant.org/
AtCoder: https://atcoder.jp/
Google Code Jam: https://codingcompetitions.withgoogle.com/codejam
"Algorithms, Part I" by Robert Sedgewick and Kevin Wayne (online course on Coursera)

| Code: BCECCE8301 | Major Project/Dissertation | 10 Credits [LTP: 0-0-20] |
|---|---|---|

| A | Details |
|---|---|

The students will undertake a project as part of their final semester. The students can do independent projects or can take up projects in groups of two or more depending on the complexity of the project. The maximum group size will be four and in case of team projects there should be a clear delineation of the responsibilities and work done by each project member. The projects must be approved by the mentor assigned to the student. The mentors will counsel the students for choosing the topic for the projects and together they will come up with the objectives and the process of the project. From there, the student takes over and works on the project.
If the student chooses to undertake an industry project, then the topic should be informed to the mentor, and the student should appear for intermediate valuations. Prior to undertaking this project the students undergo a bridge course.

**Bridge Course:**
The bridge course ensures that all the students have the correct prerequisite knowledge before their industry interface. The purpose of a bridge course is to prepare for a healthy interaction with industry and to meet their expectations. It would be difficult to establish standards without appropriate backgrounds and therefore to bridge this gap, students are put through a week mandatory classroom participation where faculty and other experts will give adequate inputs in application based subjects, IT and soft skills.

**The Project:**
Each student will be allotted a Faculty Guide and an Industry Guide during the internship/project work. Students need to maintain a Project Diary and update the project progress, work reports in the project diary. Every student must submit a detailed project report as per the provided template. In the case of team projects, a single copy of these items must be submitted but each team member will be required to submit an individual report detailing their own contribution to the project.
Each student/group should be allotted a supervisor and periodic internal review shall be conducted which is evaluated by panel of examiners.
**Project Evaluation Guidelines:**
The Project evaluator(s) verify and validate the information presented in the project report.
The break-up of marks would be as follows:

1. Internal Evaluation
2. External Assessment
3. Viva Voce

**Internal Evaluation:**
Internal Evaluator of project needs to evaluate Internal Project work based on the following criteria:

- Project Scope , Objectives and Deliverables
- Research Work, Understanding of concepts
- Output of Results and Proper Documentation
- Interim Reports and Presentations– Twice during the course of the project

**External Evaluation:**
The Project evaluator(s) perform the External Assessment based on the following criteria.

- Understanding of the Project Concept
- Delivery Skill
- The Final Project Report
- Originality and Novelty

**The Final Project Report Details:**

- The report should have an excel sheet that documents the work of every project member

**Viva Voce**

- Handling questions
- Clarity and Communication Skill

**Marking Scheme:**

1. **Internal Evaluation:** 35% of Total Marks
2. **External Evaluation:** 50% of Total Marks
3. **Viva Voce:** 15 % of Total Marks

**For e.g.,** If the total mark for the project is 100, then

- Internal Evaluation = 35 marks

The break-up of marks is shown below:-

- Interim Evaluation 1: 10 marks
- Interim Evaluation 2: 10 marks
- Understanding of concepts: 5 marks
- Programming technique: 5 marks
- Execution of code : 5 marks
- External Evaluation = 50 marks

The break-up of marks is shown below:-

- Project Report: 15 marks
- Explanation of project working: 10 marks
- Execution of code: 10 marks – (if done in industry, a stand-alone module can be reprogrammed and submitted. Error rectification etc. can be included by the evaluator)
- Participation in coding: 15 marks
- Viva Voce = 15 marks

The break-up of marks is shown below: -

- Questions related to project: 10 marks
- Questions related to technology: 5 marks

The Project evaluator(s) verifies and validates the information presented in the project report

********** HAPPY LEARNING **********