



**PRESIDENCY  
UNIVERSITY**

# **PROGRAMME REGULATIONS & CURRICULUM**

2024-27

**PRESIDENCY  
SCHOOL OF INFORMATION SCIENCE**

**BACHELOR OF COMPUTER APPLICATIONS (DATA SCIENCE)**

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**PRESIDENCY UNIVERSITY**

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956  
Approved by AICTE, New Delhi

**PRESIDENCY SCHOOL OF INFORMATION SCIENCE**

## **Program Regulations and Curriculum**

**2024-2027**

**BACHELOR OF COMPUTER APPLICATIONS**

**(Data Science)**

**based on Choice Based Credit System (CBCS) and Outcome Based  
Education (OBE)**

*(As amended up to the 24<sup>th</sup> Meeting of the Academic Council held on 3<sup>rd</sup> August 2024. This document  
supersedes all previous guidelines)*

**Regulations No.: PU/AC-24.6/SOIS05/BCD/2024-2027**

*Resolution No.6 of the 24th Meeting of the Academic Council held on 3rd August 2024, and ratified by  
the Board of Management in its 24th Meeting held on 5th August 2024*

**AUGUST-2024**

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## **PART A – PROGRAM REGULATIONS**

### **1. Vision & Mission of the University and the School / Department**

#### ***1.1 Vision of the University***

To be a Value-driven Global University, excelling beyond peers and creating professionals of integrity and character, having concern and care for society.

#### ***1.2 Mission of the University***

- Commit to be an innovative and inclusive institution by seeking excellence in teaching, research and knowledge-transfer.
- Pursue Research and Development and its dissemination to the community, at large.
- Create, sustain and apply learning in an interdisciplinary environment with consideration for ethical, ecological and economic aspects of nation building.
- Provide knowledge-based technological support and services to the industry in its growth and development.
- To impart globally-applicable skill-sets to students through flexible course offerings and support industry's requirement and inculcate a spirit of new-venture creation.

#### ***1.3 Vision of Presidency School of Information Science***

To be a value based, practice-driven School of Information Science, committed to developing globally-competent Professionals, dedicated to applying Modern Information Science for Social Benefit

#### ***1.4 Mission of Presidency School of Information Science***

- Cultivate a practice-driven environment with an Information-Technology-based pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the Information Science Domain.
- Establish state-of-the-art facilities for effective Teaching and Learning experiences.
- Promote Interdisciplinary Studies to nurture talent for global impact.
- Instil Entrepreneurial and Leadership Skills to address Social, Environmental and Community-needs.

### **2. Preamble to the Program Regulations and Curriculum**

This is the subset of Academic Regulations and it is to be followed as a requirement for the award of BCA degree.

The Curriculum is designed to take into the factors listed in the Choice Based Credit System (CBCS) with focus on Social Project Based Learning, Industrial Training, and Internship to enable the students to become eligible and fully equipped for employment in industries, choose higher studies or entrepreneurship.

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations, 2025 of the University, the Academic Council hereby makes the following Regulations.

### **3. Short Title and Applicability**

- a. These Regulations shall be called the Bachelor of Computer Applications Degree Program Regulations and Curriculum 2024-2026.
- b. These Regulations are subject to, and pursuant to the Academic Regulations.
- c. These Regulations shall be applicable to the ongoing Bachelor of Computer Applications Degree Programs of the 2024-2026 batch, and to all other Bachelor of Computer Applications Degree Programs which may be introduced in future.

- d. These Regulations shall supersede all the earlier Bachelor of Computer Applications Program Regulations and Curriculum, along with all the amendments thereto.
- e. These Regulations shall come into force from the Academic Year 2024-2025.

#### 4. Definitions

*In these Regulations, unless the context otherwise requires:*

- a. *“Academic Calendar” means the schedule of academic and miscellaneous events as approved by the Vice Chancellor;*
- b. *“Academic Council” means the Academic Council of the University;*
- c. *“Academic Regulations” means the Academic Regulations, of the University;*
- d. *“Academic Term” means a Semester or Summer Term;*
- e. *“Act” means the Presidency University Act, 2013;*
- f. *“AICTE” means All India Council for Technical Education;*
- g. *“Basket” means a group of courses bundled together based on the nature/type of the course;*
- h. *“BOE” means the Board of Examinations of the University;*
- i. *“BOG” means the Board of Governors of the University;*
- j. *“BOM” means the Board of Management of the University;*
- k. *“BOS” means the Board of Studies of a particular Department/Program of Study of the University;*
- l. *“CGPA” means Cumulative Grade Point Average as defined in the Academic Regulations;*
- m. *“Clause” means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;*
- n. *“COE” means the Controller of Examinations of the University;*
- o. *“Course In Charge” means the teacher/faculty member responsible for developing and organising the delivery of the Course;*
- p. *“Course Instructor” means the teacher/faculty member responsible for teaching and evaluation of a Course;*
- q. *“Course” means a specific subject usually identified by its Course-code and Course-title, with specified credits and syllabus/course-description, a set of references, taught by some teacher(s)/course-instructor(s) to a specific class (group of students) during a specific Academic Term;*
- r. *“Curriculum Structure” means the Curriculum governing a specific Degree Program offered by the University, and, includes the set of Baskets of Courses along with minimum credit requirements to be earned under each basket for a degree/degree with specialization/minor/honours in addition to the relevant details of the Courses and Course catalogues (which describes the Course content and other important information about the Course). Any specific requirements for a particular program may be brought into the Curriculum structure of the specific program and relevant approvals should be taken from the BOS and Academic Council at that time.*
- s. *“DAC” means the Departmental Academic Committee of a concerned Department/Program of Study of the University;*
- t. *“DAC” means, the Departmental Academic Committee;*
- u. *“Dean” means the Dean / Director of the concerned School;*
- v. *“Dean” means the Dean of the concerned School;*
- w. *“Degree Program” includes all Degree Programs;*
- x. *“Degree Program” includes all Degree Programs;*
- y. *“Department” means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;*
- z. *“Discipline” means specialization or branch of BCA Degree Program;*
- aa. *“HOD” means the Head of the concerned Department;*

- bb. *“L-T-P-C” means Lecture-Tutorial-Practical-Credit – refers to the teaching – learning periods and the credit associated;*
- cc. *“MOOC” means Massive Open Online Courses;*
- dd. *“MOU” means the Memorandum of Understanding;*
- ee. *“NPTEL” means National Program on Technology Enhanced Learning;*
- ff. *“Parent Department” means the department that offers the Degree Program that a student undergoes;*
- gg. *“Program Head” means the administrative head of a particular Degree Program/s;*
- hh. *“Program Regulations” means the Bachelor of Computer Application (DS) Degree Program Regulations and Curriculum, 2024-2027;*
- ii. *“Program” means the Bachelor of Computer Application (BCA) Degree Program;*
- jj. *“PSIS” means the Presidency School of Information Science;*
- kk. *“Registrar” means the Registrar of the University;*
- ll. *“School” means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;*
- mm. *“Section” means the duly numbered Section, with Clauses included in that Section, of these Regulations;*
- nn. *“SGPA” means the Semester Grade Point Average as defined in the Academic Regulations, 2021;*
- oo. *“Statutes” means the Statutes of Presidency University;*
- pp. *“Sub-Clause” means the duly numbered Sub-Clause of these Program Regulations;*
- qq. *“Summer Term” means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days;*
- rr. *“SWAYAM” means Study Webs of Active Learning for Young Aspiring Minds.*
- ss. *“UGC” means University Grant Commission;*
- tt. *“University” means Presidency University, Bengaluru; and*
- uu. *“Vice Chancellor” means the Vice Chancellor of the University.*

## **5. Program Description**

The Bachelor of Computer Applications Program Regulations and Curriculum 2024-2027 are subject to, and pursuant to the Academic Regulations, 2021. These Program Regulations shall be applicable to the following ongoing Bachelor of Computer Applications Degree Programs of 2024-2027 offered by the Presidency School of Information Science (PSIS):

1. Bachelor of Computer Applications abbreviated as BCA.
2. Bachelor of Computer Applications in Artificial Intelligence and Machine Learning, abbreviated as BCA. (Artificial Intelligence and Machine Learning).
3. Bachelor of Computer Applications in Data Science, abbreviated as BCA. (Data Science).

5.1 These Program Regulations shall be applicable to other similar programs, which may be introduced in future.

5.2 These Regulations may evolve and get amended or modified or changed through appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.

5.3 The effect of periodic amendments or changes in the Program Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations.

## **6. Minimum and Maximum Duration**

- 6.1 Bachelor of Computer Applications Degree Program is a Three Year, Full-Time Semester based program. The minimum duration of the BCA Program is three (03) years and each year comprises of two academic Semesters (Odd and Even Semesters) and hence the duration of the BCA program is six (06) Semesters.
- 6.2 A student who for whatever reason is not able to complete the Program within the normal period or the minimum duration (number of years) prescribed for the Program, may be allowed a period of two years beyond the normal period to complete the mandatory minimum credits requirement as prescribed by the concerned Program Regulations and Curriculum. In general, the permissible maximum duration (number of years) for completion of Program is 'N' + 2 years, where 'N' stands for the normal or minimum duration (number of years) for completion of the concerned Program as prescribed by the concerned Program Regulations and Curriculum.
- 6.3 The time taken by the student to improve Grades/CGPA, and in case of temporary withdrawal/re-joining (Refer to Clause 16.1 of Academic Regulations), shall be counted in the permissible maximum duration for completion of a Program.
- 6.4 In exceptional circumstances, such as temporary withdrawal for medical exigencies where there is a prolonged hospitalization and/or treatment, as certified through hospital/medical records, women students requiring extended maternity break (certified by registered medical practitioner), and, outstanding sportspersons representing the University/State/India requiring extended time to participate in National/International sports events, a further extension of one (01) year may be granted on the approval of the Academic Council.
- 6.5 The enrolment of the student who fails to complete the mandatory requirements for the award of the concerned Degree (refer Section 19.0 of Academic Regulations) in the prescribed maximum duration (Sub-Clauses 18.1 and 18.2 of Academic Regulations), shall stand terminated and no Degree shall be awarded.

## **7 Programme Educational Objectives (PEO)**

After four years of successful completion of the program, the graduates shall be:

**PEO 01:** Demonstrate success as a computer professional with innovative skills, having moral and ethical values.

**PEO 02:** Engage in lifelong learning through software development.

**PEO 03:** Serve as a leader in the profession through consultancy, extension activities and/ or entrepreneurship.

## **8 Programme Outcomes (PO) and Programme Specific Outcomes (PSO)**

### **8.1 Programme Outcomes (PO)**

On successful completion of the Program, the students shall be able to:

**On successful completion of the Program, the students shall be able to:**

**PO 1.** Application of Domain Knowledge: Apply the domain knowledge such as mathematics, science and software engineering fundamentals into the Computer Application related professions.

**PO 2:** Problem Solving & Analysis: Identify, Formulate, Analyse and Solve Complex Scenarios related to Computer Applications.

**PO 3:** Design/development of Activities: Conceive, Design and Develop various activities of Computer Applications.

**PO 4:** Conduct Investigations of Events: Carry out Investigation of an event and draw logical conclusions based on critical thinking and analytical reasoning.

**PO 5:** Modern Tool usage: Effectively apply relevant ICT Tools and digital tools to carry out Computer Application Attributes.

**PO 6:** Research: Identify suitable Research Methods and report the findings.

**PO 7:** Profession and Society: Apply the knowledge of the values and beliefs of multicultural society and a global perspective in the profession.

**PO 8:** Ethics: Identify ethical issues and embrace ethical values in conduct of Profession.

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

**PO 10:** Communication: Express thoughts and ideas effectively in writing and oral communication

**PO 11:** Project Management and Finance: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

**PO 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 societal and technological change.

## **8.2 Program Specific Outcomes (PSOs):**

On successful completion of the Program, the students shall be able to:

**PSO-1: [Data Analysis]:** Capable of demonstrating comprehensive knowledge using statistical and machine learning techniques to analyze data and derive meaningful insights and patterns.

**PSO-2: [Design/ development of Solutions]:** Identify, formulate and apply the knowledge of Machine learning algorithms, Deep Learning Algorithms and Big data technologies and tools for processing and analysing large datasets.

**PSO-3: [Data Science Applications]** Students should be able to apply data science techniques, and translate data insights into actionable recommendations in specific domains, such as finance, healthcare, or marketing, etc.,

## **9 Admission Criteria (as per the concerned Statutory Body)**

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be made through a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time. The admission criteria to the BCA Program is listed in the following Sub-Clauses:

- 9.1. An applicant who has successfully completed Pre-University course or Senior Secondary School course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognized university of India or outside or from Senior Secondary Board or equivalent, constituted or recognized by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the Program.
- 9.2. Provided further A candidate seeking admission for BCA Program should have passed 10+2 or an equivalent examination from any recognized board with a minimum of 40 % marks in aggregate.
- 9.3. Reservation for the SC / ST and other backward classes shall be made in accordance with the directives



issued by the Government of Karnataka from time to time.

- 9.4. Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission, issued from time to time, by the Government of India.
- 9.5. Candidates must fulfil the medical standards required for admission as prescribed by the University.
- 9.6. If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.
- 9.7. The decision of the BOM regarding the admissions is final and binding.

## **10 Transfer Students requirements**

### **10.1. Transfer of student(s) from another recognized University to the 2<sup>nd</sup> year (3<sup>rd</sup> Semester) of the BCA. Program of the University**

- 10.1.1. A student who has completed the 1st Year (i.e., passed in all the Courses / Subjects prescribed for the 1st Year) of the BCA Three-Year Degree Program from another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the BCA Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:
- 10.1.2. The concerned student fulfils the criteria specified in Sub-Clauses 2.3.1, 2.3.2 and 2.3.3.
- 10.1.3. The student shall submit the Application for Transfer along with a non-refundable Application Fee (as prescribed by the University from time to time) to the University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) BCA Program commencing on August 1 on the year concerned.
- 10.1.4. The student shall submit copies of the respective Marks Cards / Grade Sheets / Certificates along with the Application for Transfer.
- 10.1.5. The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the BCA. three-year Degree Program from the concerned University, are declared equivalent and acceptable by the Equivalence Committee constituted by the Vice Chancellor for this purpose. Further, the Equivalence Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the BCA Program of the University.
- 10.1.6. The Branch / Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

## **11 Change of Branch / Discipline / Specialization**

A student admitted to a particular Branch of the BCA Program will normally continue studying in that Branch till the completion of the program. However, the University reserves the right to provide the option for a change of Branch, or not to provide the option for a change of Branch, at the end of 1st Year of the BCA Program to eligible students in accordance with the following rules and guidelines: framed by the University from time to time.

- 11.1. Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the BCA Program and obtained a CGPA of not less than 6.50 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.
- 11.2. Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the BCA Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.
- 11.3. The student provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the BCA Program, the Fee Policy pertaining to that Branch of the BCA Program, and, all other rules pertaining to the changed Branch existing at the time.
- 11.4. Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.
- 11.5. The eligible student may be allowed a change in Branch, strictly in order of inter se merit, subject to the conditions given below:
- 11.6. The actual number of students in the 3rd Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch; and,
- 11.7. The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.
- 11.8. The process of change of Branch shall be completed within the first five days of Registration for the 3rd Semester of the BCA Program.

## **12. Specific Regulations regarding Assessment and Evaluation (including the Assessment Details of NTCC Courses, Weightages of Continuous Assessment and End Term Examination for various Course Categories)**

12.1 The academic performance evaluation of a student in a Course shall be according to the University Letter Grading System based on the class performance distribution in the Course.

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to

each component of Continuous Assessments (refer Clause 8.8) shall be clearly defined in the Course Plan for every Course, and approved by the DAC.

12.3 Format of the End-Term examination shall be specified in the Course Plan.

12.4 Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:

- Non-Teaching Credit Courses (NTCC)
- Courses with a class strength less than 30

Absolute grading method may be adopted, where necessary with prior approval of concerned DAC.

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10) shall be awarded to a student based on her/his overall performance relative to the class performance distribution in the concerned Course. These Letter Grades not only indicate a qualitative assessment of the student’s performance but also carry a quantitative (numeric) equivalent called the Grade Point.

### 12.5 Assessment Components and Weightage

<b>Nature of Course and Structure</b>	<b>Evaluation Component</b>	<b>Weightage</b>
<b>Lecture-based Course</b> L component in the L-T-P Structure is predominant (more than 1) (Examples: 3-0-0; 3-0-2; 2-1-0; 2-0-2, 2-0-4 etc.)	Continuous Assessments	50%
	End Term Examination	50%
<b>Lab/Practice-based Course</b> P component in the L-T-P Structure is predominant (Examples: 0-0-4; 1-0-4; 1-0-2; etc.)	Continuous Assessments	100%
	End Term Examination	0%
<b>Skill based Courses</b> like Industry Internship, Capstone project, Research Dissertation, Integrative Studio, Interdisciplinary Project, Summer / Short Internship, Social Engagement / Field Projects, Portfolio, and such similar Non-Teaching Credit Courses, where the pedagogy does not lend itself to a typical L-T-P structure	Guidelines for the assessment components for the various types of Courses, with recommended weightages, shall be specified in the concerned Program Regulations and Curriculum / Course Plans, as applicable.	

The exact weightages of Evaluation Components shall be clearly specified in the concerned PRC and respective Course Plan.

Normally, for Practice/Skill based Courses, without a defined credit structure (L–T–P) [NTCC], but with assigned Credits (as defined in clause 5.2 of the Academic Regulations), the method of evaluation shall be based only on Continuous Assessments. The various components of Continuous Assessments, the distribution of weightage among such components, and the method of evaluation/assessment, shall be as decided and indicated in the Course Plan/PRC. The same shall be approved by the respective DAC.

#### **12.6 Minimum Performance Criteria:**

##### **12.6.1. Theory only Course and Lab/Practice Embedded Theory Course**

A student shall satisfy the following minimum performance criteria to be eligible to earn the credits towards the concerned Course:

- a. A student must obtain a minimum of 30% of the total marks/weightage assigned to the End Term Examinations in the concerned Course.
- b. The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of the components of Continuous Assessments, Mid Term Examinations and End Term Examinations in the concerned Course.

##### **12.6.2. Lab/Practice only Course and Project Based Courses**

The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of all assessment components in the concerned Course.

- 12.6.3. A student who fails to meet the minimum performance criteria listed above in a Course shall be declared as “Fail” and given “F” Grade in the concerned Course. For theory Courses, the student shall have to re-appear in the “Make-Up Examinations” as scheduled by the University in any subsequent semester, or, re-appear in the End Term Examinations of the same Course when it is scheduled at the end of the following Semester or Summer Term, if offered. The marks obtained in the Continuous Assessments (other than the End Term Examination) shall be carried forward and be included in computing the final grade, if the student secures the minimum requirements (as per Clause 8.9.1, 8.9.2 ) in the “Make-Up Examinations” of the concerned Course. Further, the student has an option to re-register for the Course and clear the same in the summer term/ subsequent semester if he/she wishes to do so, provided the Course is offered.

#### **13. Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc. – Note: These are covered in Academic Regulations**

The University allows students to acquire credits from other Indian or foreign institutions and/or Massive Open Online Course (MOOC) platforms, subject to prior approval. These credits may be transferred and counted toward fulfilling the minimum credit requirements for the award of a degree. The process of transfer of credits is governed by the following rules and guidelines:

- 13.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (**Refer Annexure B**) and approved by the Dean - Academics.
- 13.2 Students may earn credits from other Indian or foreign Universities/Institutions with which the University has an MOU, and that MOU shall have specific provisions, rules and guidelines for transfer

of credits. These transferred credits shall be counted towards the minimum credit requirements for the award of the degree.

13.3 Students may earn credits by registering for Online Courses offered by *Study Web of Active Learning by Young and Aspiring Minds* (SWAYAM) and *National Program on Technology Enhanced Learning* (NPTEL), or other such recognized Bodies/ Universities/Institutions as approved by the concerned BOS and Academic Council from time to time. The concerned School/Parent Department shall publish/include the approved list of Courses and the rules and guidelines governing such transfer of credits of the concerned Program from time to time. The Rules and Guidelines for the transfer of credits specifically from the Online Courses conducted by SWAYAM/ NPTEL/ other approved MOOCs are as stated in the following Sub-Clauses:

- 13.3.1. A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 13.3 and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and/or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.
- 13.3.2. SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 13.3 shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.
- 13.3.3. Parent Departments may release a list of SWAYAM/NPTEL/other approved MOOCs for Pre-Registration as per schedule in the Academic Calendar or through University Notification to this effect.
- 13.3.4.** Students may Pre-Register for the SWAYAM/NPTEL/other approved MOOCs in the respective Departments and register for the same Courses as per the schedule announced by respective Online Course Offering body/institute/ university.
- 13.3.5. A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 13.3.2 above.
- 13.3.6. SWAYAM/NPTEL/other approved MOOCs Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM/NPTEL/other approved MOOCs and obtained a certificate of successful/satisfactory completion.
- 13.3.7. A student who has successfully completed the approved SWAYAM/NPTEL/ other approved MOOCs and wants to avail the provision of transfer of equivalent credits, must submit the original Certificate of Completion, or such similar authorized documents to the HOD concerned, with a written request for the transfer of the equivalent credits. On verification of the Certificates/Documents and approval by the HOD concerned, the Course(s) and equivalent Credits shall be forwarded to the COE for processing of results of the concerned Academic Term.
- 13.3.8. The credit equivalence of the SWAYAM/NPTEL/other approved MOOCs are based on Course durations and/or as recommended by the Course offering body/institute/university. The Credit Equivalence mapped to SWAYAM/ NPTEL approved Courses based on Course durations for transfer of credits is summarised in Table shown below. The Grade will be calculated from the marks received by the Absolute Grading Table 8.11 **Error! Reference source not found..**

<b>Table 2: Durations and Credit Equivalence for Transfer of Credits from SWAYAM-NPTEL/ other approved MOOC Courses</b>		
<b>Sl. No.</b>	<b>Course Duration</b>	<b>Credit Equivalence</b>
1	4 Weeks	1 Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

13.3.9. The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

13.3.10. The University shall not reimburse any fees/expense; a student may incur for the SWAYAM/NPTEL/other approved MOOCs.

13.4 The maximum number of credits that can be transferred by a student shall be limited to forty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree. However, the grades obtained in the Courses transferred from other Institutions/MOOCs, as mentioned in this Section , shall not be included in the calculation of the CGPA.

## **PART B: PROGRAM STRUCTURE**

### **14. Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements**

The BCA Program Structure (2024-2027) totalling 120 credits. Table 7 summarizes the type of baskets, number of courses under each basket and the associated credits that are mandatorily required for the completion of the Degree.

<b>Table 3: BCA 2024-2027: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets</b>		
<b>Sl. No.</b>	<b>Baskets</b>	<b>Credit Contribution</b>
1	Core Courses	50
2	Ability Enhancement Courses	8
3	Multi-Disciplinary Elective course	3
4	Value added Courses	6
5	Skill Enhancement courses	29
6	Discipline Specific Elective	24

<b>Table 3: BCA 2024-2027: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets</b>		
<b>Sl. No.</b>	<b>Baskets</b>	<b>Credit Contribution</b>
	Total Credits	120 (Minimum)

In the entire Program, the practical and skill-based course component contribute to an extent of approximately 62% out of the total credits of 120 for BCA program of three years' duration.

#### **15. Minimum Total Credit Requirements of Award of Degree**

As per the AICTE guidelines, a minimum of 120 credits is required for the award of a BCA degree.

#### **16. Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies,**

- 16.1 The award of the Degree shall be recommended by the Board of Examinations and approved by the Academic Council and Board of Management of the University.
- 16.2 A student shall be declared to be eligible for the award of the concerned Degree if she/he:
  - a. Fulfilled the Minimum Credit Requirements and the Minimum Credits requirements under various baskets;
  - b. Secure a minimum CGPA of 4.50 in the concerned Program at the end of the Semester/Academic Term in which she/he completes all the requirements for the award of the Degree as specified in Sub-Clause a of Academic Regulations;
  - c. No dues to the University, Departments, Hostels, Library, and any other such Centers/ Departments of the University; and
  - d. No disciplinary action is pending against her/him.

## PART C: CURRICULUM STRUCTURE

### 17. Curriculum Structure – Basket Wise Course List (not Semester Wise)

**List of Courses Tabled – aligned to the Program Structure  
(Course Code, Course Name, Credit Structure (LTFC), Contact Hours, Course Basket, Type of Skills etc., as applicable).**

<b>Table 3.1 : Ability Enhancement Courses (AEC)</b>						
<b>S.No</b>	<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	ENG1003	Communicative English	2	0	0	2
2	PPS1001	Introduction to soft skills	0	0	2	1
3	ENG2005	Technical Written Communication	2	0	0	2
4	PPS1006	Employability for young professionals	0	0	2	1
5	PPS2002	Being Corporate Ready	0	0	2	1
6	PPS3001	Problem Solving through Aptitude	0	0	2	1
<b>Total No. of Credits</b>						<b>8</b>

<b>Table 3.2 : Skill Enhancement Courses (SEC)</b>						
<b>S.No</b>	<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CSA1001	Problem Solving using C	2	0	4	4
2	CSA1002	Web Design and Development	1	0	4	3
3	CSA1004	Programming in Python	1	0	4	3
4	CSAXXXX	Object Oriented Programming using Java	0	0	6	3
5	CSA3003	Android Mobile Application Development	0	0	6	3
6	CSA3009	UI/UX Design	0	0	6	3
7	CSA3005	Internet of Things	1	0	4	3
8	CSA3100	Summer Internship	-	-	-	3
9	CSA3101	Project	-	-	-	4
<b>Total No. of Credits</b>						<b>29</b>

<b>Table 3.3 : Core Courses (CC)</b>						
<b>S.No</b>	<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	MAT2007	Applied Mathematics	3	0	0	3
2	ECE2009	Digital Computer Fundamentals	2	0	2	3
3	CSA1003	Fundamentals of Data Science	3	0	0	3
4	MAT1006	Statistical Methods and Techniques	3	0	0	3
5	CSA2101	Data Structures and Algorithms	3	0	0	3
6	CSA2100	Data Structures and Algorithms Lab	0	0	2	1
7	CSA2004	Computer Networks	3	0	0	3
8	CSA2002	Computer Organization	3	0	0	3
9	CSA2103	Relational Database Management Systems	3	0	0	3
10	CSA2104	Relational Database Management Systems Lab	0	0	2	1
11	CSAXXXX	Data Modelling and Visualization	0	0	6	3



12	CSA2005	Analysis of Algorithms	2	1	0	3
13	CSAXXXX	Operating Systems and Unix Programming	2	0	2	2
14	CSAXXXX	Operating Systems and Unix Programming Lab	0	0	2	1
15	CSA2006	Fundamentals of Software Engineering	3	0	0	3
16	CSA3002	Machine Learning Algorithms	3	0	0	3
17	CSA3069	Data Management using Cloud	3	0	0	3
18	CSAXXXX	Machine Learning Algorithms Lab	0	0	2	1
19	CSAXXXX	Data Mining	3	0	0	3
20	CSAXXXX	Statistical Analysis using R Programming	0	0	4	2
<b>Total No. of Credits</b>						<b>50</b>

<b>Table 3.4 : Discipline Specific Elective (DSE)</b>						
<b>S.No</b>	<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CSAXXXX	Discipline Specific Elective– I	0	0	6	3
2	CSAXXXX	Discipline Specific Elective– II	0	0	6	3
3	CSAXXXX	Discipline Specific Elective– III	3	0	0	3
4	CSAXXXX	Discipline Specific Elective– IV	3	0	0	3
5	CSAXXXX	Discipline Specific Elective– V	3	0	0	3
6	CSAXXXX	Discipline Specific Elective – VI	3	0	0	3
7	CSAXXXX	Discipline Specific Elective - VII	0	0	6	3
8	CSAXXXX	Discipline Specific Elective - VIII	0	0	6	3
<b>Total No. of Credits</b>						<b>24</b>

<b>Table 3.5 : Multi Disciplinary Course (MDC)</b>						
<b>S.No</b>	<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CSAXXXX	Multi-Disciplinary Elective – I	3	0	0	3
<b>Total No. of Credits</b>						<b>6</b>

<b>Table 3.6 : Value Added Course (VAC)</b>						
<b>S.No</b>	<b>Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CHEXXXX	Environmental Studies and Sustainable Development	2	0	0	2
2	LAWXXXX	Indian Constitution	2	0	0	2
3	DESXXXX	Design thinking and Innovation	2	0	0	2
<b>Total No. of Credits</b>						<b>6</b>

#### **18. Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project**

Practical / Skill based Courses like internship, project work, capstone project, research project / dissertation, and such similar courses, where the pedagogy does not lend itself to a typical L-T-P-C Structure as defined in Clause 5.1 of the Academic Regulations, 2021, are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with

hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations, 2021). The same shall be prescribed in the Course Handout.

### **18.1 Internship**

A student may opt to undertake Internship for a duration of 10-12 weeks during the 6th semester, while concurrently completing the remaining registered courses for that semester. This project work shall be considered equivalent to an internship, subject to the following conditions:

*18.1.1* The Internship shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.

*18.1.2* The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Internship to a student;

*18.1.3* The number of Internships available for the concerned Academic Term. Further, the available number of internships shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Internship, as stated in Sub-Clause 2.6.1.2 above.

*18.1.4* A student may opt for Internship in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Internship confirms to the University that the Internship shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

*18.1.5* A student selected for an Internship in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

### **18.2 Project Work**

A student may opt to do a Project Work for a period of 12-16 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Internship during the 6th Semester as applicable, while concurrently completing the remaining registered courses for that semester. subject to the following conditions:

*18.2.1* The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

*18.2.2* The student may do the project work in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 2.6.2.1). Provided further, that the Industry / Company or academic / research institution offering such project work confirms to the University that the project work will be conducted in accordance

with the Program Regulations and requirements of the University.

### **18.3 Capstone Project**

A student may undergo a Capstone Project for a period of 12-14 weeks in an industry / company or academic / research institution in the 4th Semester as applicable, while concurrently completing the remaining registered courses for that semester. subject to the following conditions:

- 18.3.1** The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.
- 18.3.2** The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Capstone Project to a student;
- 18.3.3** The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated in Sub-Clause 2.6.3.2 above.
- 18.3.4** A student may opt for Capstone Project in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the I Capstone Project on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Capstone Project confirms to the University that the Capstone Project shall be conducted in accordance with the Program Regulations and Internship Policy of the University.
- 18.3.5** A student selected for a Capstone Project in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Capstone Project Policy of the University.

### **18.4 Research Project / Dissertation**

A student may opt to do a Research Project / Dissertation for a period of 12-14 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Capstone Project/Internship/Project, subject to the following conditions:

- 18.4.1** The Research Project / Dissertation shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 2.6.4.1). Provided further, that the Industry / Company or academic / research institution offering such Research Project / Dissertation confirms to the University that the Research

Project / Dissertation work will be conducted in accordance with the Program Regulations and requirements of the University.

### 19. List of Elective Courses under various Specialisations / Stream Basket

<b>Table 3.7 : Discipline Specific Elective – Minimum of 15 credits is to be earned by the student in a particular track and overall 24 credits.</b>						
<b>Track 1 - Full Stack and Front End</b>						
S.No	Course Code	Course Name	L	T	P	C
1	CSAXXXX	.Net Programming Using C#	0	0	6	3
2	CSAXXXX	No SQL	0	0	6	3
3	CSA3054	Agile Structures and Frameworks	3	0	0	3
4	CSA1007	Introduction to Devops	3	0	0	3
5	CSAXXXX	Front-End Development using Java Script	0	0	6	3
6	CSAXXXX	Web Application Development	0	0	6	3
<b>Track 2 – Data Science &amp; AIML</b>						
S.No	Course Code	Course Name	L	T	P	C
1	CSAXXXX	AI in Finance and Business Accounting	0	0	6	3
2	CSAXXXX	Pattern Recognition	0	0	6	3
3	CSA3089	Predictive Analytics	0	0	6	3
4	CSA3070	Time Series Analysis	3	0	0	3
5	CSA2118	Security aspects of ML	3	0	0	3
6	MAT1008	Probability and Inferential Statistics	3	0	0	3
<b>Track 3 – Cloud and Network</b>						
S.No	Course Code	Course Name	L	T	P	C
1	CSAXXXX	Principles of Cloud Computing	3	0	0	3
2	CSAXXXX	Data Management using Cloud	3	0	0	3
3	CSAXXXX	Enterprise and Cloud computing	3	0	0	3
4	CSA3027	Cryptography and Network security	3	0	0	3
5	CSA3050	Ethical Hacking	3	0	0	3
6	CSA3073	Data Security and Privacy	3	0	0	3

### 20. List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters.

<b>Table 3.8 : Open Elective Courses Baskets: Minimum Credits to be earned from this Basket is 6</b>						
Sl. No.	Course Code	Course Name	L	T	P	C
1	COM2001	Introduction to Human Resource Management	3	0	0	3

2	COM2002	Finance for Non Finance	3	0	0	3
3	COM2004	Introduction to Banking	3	0	0	3
4	COM2005	Introduction to Insurance	3	0	0	3
5	COM2007	Basics of Accounting	3	0	0	3
6	CSE3116	No Code AI	2	0	2	3
7	DSA2002	Yoga for Health	2	0	0	2
8	DSA2003	Stress Management and Well Being	2	0	0	2
9	MEC2003	Supply Chain Management	3	0	0	3
10	MEC3201	Industry 4.0	3	0	0	3
11	MGT2002	Organizational Behavior	3	0	0	3
12	MGT2003	Competitive Intelligence	3	0	0	3
13	MGT2004	Development of Enterprises	3	0	0	3
14	MGT2011	Personal Finance	3	0	0	3
15	MGT2022	Customer Relationship Management	3	0	0	3

## 21. List of MOOC (NPTEL) Courses

### 21.1 NPTEL - Discipline Elective Courses for BCA

Sl. No.	Course ID	Course Name	Duration
1	CSAXXXX	Foundation of Cyber Physical System	12 Weeks
2	CSAXXXX	Affective Computing	12 Weeks
3	CSAXXXX	Getting Started with Competitive Programming	12 Weeks
4	CSAXXXX	The Joy of Computing using python	12 Weeks

### 21.2 NPTEL - Open Elective Courses for BCA

Sl. No.	Course ID	Course Name	Duration
1	MGTXXXX	Privacy and Security in Online social media	12 Weeks
2	MGTXXXX	Introduction to industry 4.0 and Industrial Internet of things	12 Weeks

**22.Recommended Semester Wise Course Structure / Flow including the Programme / Discipline Elective Paths / Options**

Semester 1											
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					CONTACT HOURS	BASKE T	TYPE OF SKIL L	COURSE ADDRESSES TO
			L	T	P	C					
1.	MAT2007	Applied Mathematics	3	0	0	3	3	CC	S		
2.	CSA1001	Problem Solving using C	2	0	4	4	6	SEC	S		
3.	ECE2009	Digital Computer Fundamentals	2	0	2	3	4	CC	S		
4.	CSA1002	Web Design and Development	1	0	4	3	5	SEC	S		
5.	ENG1003	Communicative English	2	0	0	2	2	AEC	S		
6.	PPS1001	Introduction to soft skills	0	0	2	1	2	AEC	S		
		<b>TOTAL</b>	<b>10</b>	<b>0</b>	<b>12</b>	<b>16</b>	<b>22</b>	-	-	-	

Semester 2											
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					CONTACT HOURS	BASKE T	TYPE OF SKIL L	COURSE ADDRESSES TO
			L	T	P	C					
1	CSA1004	Programming in Python	1	0	4	3	5	SEC	S		
2	MAT1006	Statistical Methods and Techniques	3	0	0	3	3	CC	S		
3	CSA2101	Data Structures and Algorithms	3	0	0	3	3	CC	S		
4	CSA2100	Data Structures and Algorithms Lab	0	0	2	1	2	CC	S		
5	ENG2005	Technical Written Communication	2	0	0	2	2	AEC	S		
6	CSA2004	Computer Networks	3	0	0	3	3	CC	S		
	CSA1003	Fundamentals of Data Science	3	0	0	3	3	CC	S		

7	CSA2002	Computer Organization	3	0	0	3	3	CC	S	
8	PPS1006	Employability for young professionals	0	0	2	1	2	AEC	S	
		<b>TOTAL</b>	<b>15</b>	<b>0</b>	<b>8</b>	<b>22</b>	<b>23</b>	-	-	-

Semester 3										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	BASKE T	TYPE OF SKIL L	COURSE ADDRESSES TO
			L	T	P	C				
1	CSA2103	Relational Database Management Systems	3	0	0	3	3	CC	S	
2	CSA2104	Relational Database Management Systems Lab	0	0	2	1	2	CC	S	
3	CSAXXX X	Object Oriented Programming using Java	0	0	6	3	6	SEC	S	
3	CSAXXXX	Data Modelling and Visualization	0	0	6	3	6	CC	S	
5	CSA2005	Analysis of Algorithms	2	1	0	3	2	CC	S	
6	CSAXXX X	Operating Systems and Unix Programming	2	0	2	2	4	CC	S	
7	CSAXXX X	Operating Systems and Unix Programming Lab	0	0	2	1	2	CC	S	
8	CSA2006	Fundamentals of Software Engineering	3	0	0	3	3	CC	S	
9	PPS2002	Being Corporate Ready	0	0	2	1	2	AEC	S	
10	CHE1020	Environmental Studies and Sustainable Development	2	0	0	2	2	VAC	S	
		<b>TOTAL</b>	<b>12</b>	<b>1</b>	<b>20</b>	<b>22</b>	<b>33</b>	-	-	-

Semester 4										
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S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					CONTACT HOURS	BASKE T	TYPE OF SKIL L	COURSE ADDRESSES TO
			L	T	P	C					
1	CSA3002	Machine Learning Algorithms	3	0	0	3	3	CC	S		
2	CSA3003	Android Mobile Application Development	0	0	6	3	6	SEC	S		
3	CSA3069	Data Management using Cloud	3	0	0	3	3	CC	S		
4	CSAXXX X	Machine Learning Algorithms Lab	0	0	2	1	3	CC	S		
5	CSAXXXX	Discipline Specific Elective– I	0	0	6	3	6	DSE	EM		
6	CSAXXXX	Discipline Specific Elective– II	0	0	6	3	6	DSE	EM		
7	CSAXXX X	Discipline Specific Elective– III	3	0	0	3	3	DSE	EM		
8	PPS3001	Problem Solving through Aptitude	0	0	2	1	2	AEC	S		
9	LAWXXX X	Indian Constitution	2	0	0	2	2	VAC	S		
		<b>TOTAL</b>	<b>9</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>33</b>	-	-	-	

Semester 5											
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					CONTACT HOURS	BASKE T	TYPE OF SKIL L	COURSE ADDRESSES TO
			L	T	P	C					
1	CSA2007	Data Mining	3	0	0	3	3	CC	S		
2	CSA2115	Statistical Analysis using R Programming	0	0	4	2	4	CC	S		
3	CSAXXX X	Discipline Specific Elective– IV	3	0	0	3	3	DSE	EM		
4	CSAXXX X	Discipline Specific Elective– V	3	0	0	3	3	DSE	EM		



5	CSAXXX X	Discipline Specific Elective – VI	3	0	0	3	3	DSE	EM	
6	CSA3009	UI/UX Design	0	0	6	3	6	SEC	S	
7	CSA3005	Internet of Things	1	0	4	3	6	SEC	S	
8	CSAXXX X	Multi- Disciplinary Elective – I	3	0	0	3	3	MDC	EN	
9	CSA3100	Summer Internship	-	-	-	3	0	SEC	S	
		<b>TOTAL</b>	<b>15</b>	<b>0</b>	<b>16</b>	<b>26</b>	<b>31</b>	-	-	-

Semester 6										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTA CT HOURS	BASKE T	TYPE OF SKIL L	COURSE ADDRESSES TO
			L	T	P	C				
1	DESXXX X	Design thinking and Innovation	2	0	0	2	2	VAC	S	
2	CSAXXX X	Discipline Specific Elective - VII	3	0	0	3	3	DSE	EM	
3	CSAXXX X	Discipline Specific Elective - VIII	3	0	0	3	3	DSE	EM	
4	CSA3101	Project	-	-	-	4	0	SEC	S	
		<b>TOTAL</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>8</b>	-	-	-

### 23. Course Catalogue

Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Programme Electives – Course Code, Course Name, Prerequisite, Anti-requisite, Course Description, Course Outcome, Course Content (with Blooms Level, CO, No. of Contact Hours), Reference Resources.

#### Ability Enhancement Courses

#### ENG1003 – Communicative English

<b>Course Code:</b> <b>ENG 1003</b>	<b>Course Title: Communicative English</b>		<b>L- T- P- C</b>	2	0	0	2
<b>Type of Course:</b>	<b>School Core Theory Only</b>						
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	PUC level basic English Language Skills						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	This course facilitates the holistic development of English language skills i.e., basic communication, Listening, Speaking, Reading and Writing. The course aims at developing the communicative competence of learners by participating in various narrate group activities and by enacting in role-plays pertaining to functional English. The course enables the learners to write various types of professional business letters. The course involves comprehension of business-related texts of topical relevance and drawing inferences from the given text.						
<b>Course Objectives</b>	The objective of the course is skill development of student by using Participative Learning techniques						
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Explain basic Communication Process.</li> <li>2. Apply speaking skills in various situations.</li> <li>3. Demonstrate writing strategies in drafting business letters.</li> <li>4. Interpret the ideas of the author in the text.</li> </ol>						
<b>Module 1</b>	<b>Art of Communication</b>	<b>Assignment</b>	<b>Written Assignment</b>	<b>Classes- 7</b>			
Topics: 1. Introduction: The Process of Communication, the communication cycle, noise, General and technical communication. 2. Language as a tool of communication, Characteristics of Language 3. Kinesics and proxemics, Paralinguistics and Chronemics							
<b>Module 2</b>	<b>Listen and Speak</b>	<b>Extempore</b>	<b>Speech/ Narration/Role Play</b>	<b>Classes -7</b>			
Topics: <ol style="list-style-type: none"> <li>1. <b>Narration</b> – Rules Motivational Stories –Role Play, Story Circle, Jigsaw Tale</li> <li>2. <b>Conversations</b> At the Bank</li> </ol>							

At the Airport Life in Metropolis Talking about Computers At the Post office Giving a Message on phone Customer Service Situations Talking about Weather and Temperature				
<b>Module 3</b>	<b>Business Writing</b>	<b>Assignment (Case study)</b>	<b>Exercise &amp; Quiz</b>	<b>Classes- 7</b>
Topics: 1. Basic writing skills: Introduction to writing, Cohesion, Coherence, Steps of writing 2. Effective Business Writing: Tips and Techniques, Important elements of letter writing, Layout, Types of Business letters (Order Placement, Appointments, Claims, Inquiry, Sales, and Complaint Letters)				
<b>Module 4</b>	<b>Reading Skills</b>	<b>Assignment (Reading comprehension)</b>	<b>Exercise &amp; Quiz</b>	<b>Classes- 7</b>
Topics: Importance of analytical reading, Different types of Reading, Reading Comprehension Tips & Tricks Reading Comprehension Practice – Analyze Main Idea Questions, Analyze Contextual Questions, Analyze Inference Questions				
<b>Targeted Application &amp; Tools that can be used:</b> Relevant videos from YouTube and articles for all the skills will be used to reinforce the concepts.				
<b>Project work/Assignment: Mention the Type of Project /Assignment proposed for this course</b>				
1. <b>Written Assignment on Communication skills during pandemic/natural calamity/unfavorable situation.</b> 2. <b>Quizzes based on all four modules.</b> 3. <b>Summarizing / analyzing written documents, short stories and conversations.</b>				
<b>Text Book</b> 1. Course Material by the Instructor. 2. PPT's and Videos and Worksheets provided by the instructor.				
<b>References</b> 1. Hart, Steve. Nari, Aravind R. and Bhambhani, Veena. <i>Embark: English for Undergraduates</i> . New Delhi; Cambridge University Press, 2016. 2. J. K. Gangal, <i>A Practical course in Spoken English</i> , PHL Learning Private Limited, Delhi-2014.				
<b>Web Resources</b> 1. <a href="https://presiuniv.knimbus.com/user#/searchresult?searchId=Communication%20Skills">https://presiuniv.knimbus.com/user#/searchresult?searchId=Communication%20Skills</a> 2. <a href="https://presiuniv.knimbus.com/user#/searchresult?searchId=Communicative%20English">https://presiuniv.knimbus.com/user#/searchresult?searchId=Communicative%20English</a>				
Topics relevant to development of “ EMPLOYABILITY SKILLS”: PRESENTATIONS AND PUBLIC SPEAKING Topics relevant to development of “PROFESSIONAL SKILLS”: Business Writing				

**ENG2005 – Technical Written Communication**

<b>ENG2005</b>	<b>Technical Written Communication</b>	<b>L-T- P- C</b>	2	0	0	2
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>						
<b>Anti-requisites</b>	<b>NIL</b>					
<b>Course Description</b>	In any workplace, people use their computers and mobiles to help them research, compose, design, revise, and deliver information and documents. Networked computers and mobile devices are the central nervous system of the technical workplace, and the course helps students to practice technical communication. The course aims at initiating writing skills in the field of technical communication concentrating product descriptions, letters, emails, memos etc. New media and communication technologies are dramatically altering technical fields at an outstanding rate. Students are prone to work more efficiently, more globally and more visually. These changes are incorporated in the course giving importance to online communication, such as, blog and online content writing.					
<b>Course Objective</b>	This course is designed to improve the learners' employability skills by using problem solving methodologies.					
<b>Course Outcome</b>	On successful completion of the course the students shall be able to:  <ol style="list-style-type: none"> <li>1) Apply strategies and techniques for organizing and drafting descriptions and specifications.</li> <li>2) Develop skills in writing sentences and paragraphs for content on websites and blogs.</li> <li>3) Write technical/professional emails, letters and memo</li> </ol>					
<b>Course Content:</b>						
<b>Module 1</b>	<b>Technical Descriptions and Specifications</b>					<b>15 Classes</b>
<ul style="list-style-type: none"> <li>• Technical ICT vocabulary errors/full forms of common ICT words</li> <li>• Using proper punctuation</li> <li>• ICT product descriptions</li> <li>• Writing instructions</li> <li>• User guides (step-by-step instructions, procedures, manuals)</li> </ul>						
<b>Module 2</b>	<b>Informative Summaries</b>					<b>10 Classes</b>
<p>Topic-1: Creating Infographics                      Topic-2: Creating summary maps</p>						
<b>Module 3</b>	<b>Technical Correspondence</b>					<b>5 Classes</b>
Topic-1: <b>Business &amp; Official</b> Letters, Memos and Email						

**Delivery Procedure (pedagogy):**

The course is delivered offline classroom and video recordings will be available. Each module will be discussed in the classroom along with the textbooks. Extensive writing tasks will be circulated to check students' understanding.

**Assignment:**

1. Creating user-friendly infographics
2. Drafting letters and memos for different occasions.

**Text Book**

1. Johnson, Richard. *Technical Communication Today*. Pearson, 2015.
2. Felder, Lynda. *Writing for the Web Creating Compelling Web Content Using Words, Pictures and Sound*. Pearson, 2012.

**Web Resources:**

- <https://www.cambridge.org/core/journals/publications-of-the-astronomical-society-of-australia/article/abs/3-lyman-technical-description/ACBC41A9A302D85C94AFF7CFFD9B0761>
- <https://www.cambridge.org/core/books/abs/patent-intensity-and-economic-growth/clustering-procedure-technical-description/173050CAD2CCA6F62B597981B4DB9B0F>
- <https://www-jstor-org-presiuniv.knimbus.com/stable/43748770?seq=2>
- Bridgeford, Tracy; Kitalong, Karla Saari; and Selfe, Richard, "Innovative Approaches to Teaching Technical Communication" (2004). *All USU Press Publications*. 147. [https://digitalcommons.usu.edu/usupress\\_pubs/147](https://digitalcommons.usu.edu/usupress_pubs/147)

**PPS1001 – Introduction to Soft Skills**

<b>Course Code:</b> PPS1001	<b>Course Title:</b> Introduction to Soft skills  <b>Type of Course:</b> School Core	L- T-P- C	0	0	2	1
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	<ul style="list-style-type: none"> <li>Students are expected to understand basic English.</li> <li>Students should have desire and enthusiasm to involve, participate and learn.</li> </ul>					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This course is designed to enable students to understand the importance of soft skills and improve confidence, communication and professional skills to give the students a competitive advantage and increase chances of success in the professional world. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.					
<b>Course Objective</b>	The objective of the course is skill development of student by using participative & experiential learning techniques					
<b>Course Outcome</b>	<p><b>On successful completion of this course the students shall be able to:</b></p> <p>CO1. Prepare professional social media profile</p> <p>CO2. Recognize the significance of Soft Skills</p> <p>CO3. List the techniques of unlearning poor habits and forming healthy habits</p> <p>CO4. Demonstrate appropriate team behavior &amp; people management</p> <p>CO5. Identify traits, skills and attributes required for adaptability</p> <p>CO6. Identify styles of communication</p>					
<b>Course Content:</b>						
<b>Module 1</b>	INTRODUCTION TO SOFT SKILLS	Review a Movie, Personality, Technology or Book.				<b>04 Hours</b>
<b>Topics:</b> Setting Expectations, Ice Breaker, Significance of soft skills.						
<b>Module 2</b>	PROFESSIONAL BRAND BUILDING	Brand Framework Activity				<b>04 Hours</b>
<b>Topics:</b> Significance of a profile. Creating an online profile. Networking - 100 connections, LinkedIn as a live resume, Create a dashboard.						
<b>Module 3</b>	HABIT FORMATION	Worksheets & Assignment				<b>04 Hours</b>
<b>Topics:</b> Professional and personal ethics for success, Identity based habits, Domino effect, Habit Loop, Unlearning, standing up for what is right, New skills acquisition - 10,000 hours' rule for expertise.						

<b>Module 4</b>	TEAM SYNERGY & PEOPLE MANAGEMENT	Classroom and outdoor team building activities.	<b>04 hours</b>
<b>Topics:</b> Importance of team, Get to know team needs (Maslow's Theory of needs), Trust and collaboration, Virtual Team building.			
<b>Module 5</b>	ADAPTABILITY	Situation based cases, THEATRIX on adaptability	<b>06 Hours</b>
<b>Topics:</b> Change management: VUCA, adapting to changes, growth and fixed mindset, Continuous Learning			
<b>Module 6</b>	EFFECTIVE COMMUNICATION	Communication activities / Emotional situations activities – group task	<b>04 Hours</b>
<b>Topics:</b> Different styles of communication, Difference between hearing and listening, Effective communication for success. Self-introduction framework. <b>Emotional Intelligence</b> <b>Topics:</b> Self-awareness, Empathy, Self-management, Social awareness, and Relationship management			
<b>Targeted Application &amp; Tools that can be used: LMS</b>			
<b>Assignments proposed for this course</b>			
<ol style="list-style-type: none"> <li>1. Create a dashboard on LinkedIn, Networking.</li> <li>2. Prepare a habit chart</li> </ol>			
<b>Text Book</b>			
<ol style="list-style-type: none"> <li>1. The 7 Habits of Highly Effective People, first published in 1989, is a business and self-help book written by Stephen R. Covey – ( Module – Habit Formation)</li> <li>2. The Power of Habit: Why We Do What We Do in Life and Business is a book by Charles Duhigg ( Module – Habit Formation)</li> <li>3. Leaders eat last- Simon Sinek (Module: Team skills and People Management)</li> <li>4. Social Media Marketing Workbook 2021 by Jason McDonald PhD (Module: Professional Brand building)</li> <li>5. Me 2.0: Build a Powerful Brand to Achieve Career Success (Module: Professional Brand building)</li> <li>6. Atomic Habits: An Easy &amp; Proven Way to Build Good Habits &amp; Break Bad Ones by James Clear (Module – Habit Formation)</li> </ol>			
<b>E-Resources:</b>			
<ul style="list-style-type: none"> <li>• <a href="#">How to Write a Blog on LinkedIn</a></li> <li>• <a href="#">7 steps for successful career planning (naukri.com)</a></li> </ul>			
<b>Ted Talk:</b>			
<ul style="list-style-type: none"> <li>• <a href="#">An introvert's guide to networking   Rick Turoczy   TEDxPortland - YouTube</a> (Module: Professional Brand building)</li> <li>• <a href="#">How to turn a group of strangers into a team   Amy Edmondson - YouTube</a> (Module: Team skills and People Management)</li> <li>• <a href="#">How Adaptability Will Help You Deal With Change   Jennifer Jones   TEDxNantwich - YouTube</a> (Module: Adaptability)</li> </ul>			

### PPS1006 - Employability for Young Professionals

Course Code: PPS 1006	<b>Course Title: Employability for Young Professionals</b>		L- T- P- C	0	0	2	1
	Type of Course: Practical						
Version No.	1.0						
Course Pre-requisites	Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.						
Anti-requisites	NIL						
Course Description	This course is designed to develop effective communication skills and boost confidence levels. The activity-based modules cover the art of Questioning, how to ask questions, goal setting with emphasis on time and stress management, creating the first impression and introducing one self and finally culminating with the etiquettes of email writing. The pedagogy used will be research, group discussions, flipped classrooms, continuous feedback, role-play and mentoring.						
Course Out Comes	<p style="text-align: center;"><b>On successful completion of this course the students shall be able to:</b></p> <ul style="list-style-type: none"> <li>• CO1 <b>Show</b> effective communication skills through self-introduction</li> <li>• CO2 <b>Analyse</b> information through questioning technique for better decision making</li> <li>• CO3 <b>Identify</b> individual strengths and weaknesses for self-awareness and stress management</li> <li>• CO4 <b>Apply</b> SMART technique to achieve goals and increase productivity</li> </ul>						
Course Content:							
Module 1	Art of Questioning	Role plays					4 classes
<b>Topics:</b> Note Taking, Framing Questions, Open-ended and Close-ended questions, Funnel technique, Probing questions, Leading questions, Rhetorical questions, 5WIH Technique							
	Vocab Building					Every Class	
Dedicate 5-10minutes towards vocabulary building in every session							
Module 2	Goal Setting & Time Management	Journal + Outbound training					8 Classes
Goal Setting (SMART Goals), Time Management Matrix, Steps to managing time through outbound group activity, Making a schedule, Daily Plan and calendars (To Do List), Monitoring/charting daily activity							
Module 3	Self-introduction and Creating an Impression	Grooming checks + Evaluation + Alumni talk					8 classes
<b>Topics:</b> Body Language, Grooming guidelines for boys/girls, Common mistakes in Grooming at workplace and social gathering, Etiquettes at work place & social gathering, SWOT – Self-awareness analysis, Self-introduction template, evaluation of self-introduction in class							
Module 4	E-mail Etiquette	Industry expert intervention					4 Classes
<b>Topics:</b> Dos and Don`ts of professional email etiquette, practice writing emails (activity)							
REVISION	Recap & Summary					6 Classes	
Revision of all the modules, overall feedback from the students with regards to the syllabus.							
Targeted Application & Tools that can be used: LMS							
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course							
<ol style="list-style-type: none"> <li>1) Evaluation of Self-introduction</li> <li>2) LMS MCQ</li> </ol>							



**PPS2002 - Being Corporate Ready**

<b>Course Code:</b> PPS 2002	<b>Course Title:</b> Being Corporate Ready <b>Type of Course:</b> Practical Only Course	<b>L-T-P-C</b>	0	0	2	1
<b>Version No.</b>	1.1					
<b>Course Pre-requisites</b>	Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.					
<b>Anti-requisites</b>	<b>NIL</b>					
<b>Course Description</b>	The course is designed to enhance confidence level through effective communication, presentation and group discussion skills. The corporate etiquette module intends to provide an understanding of the culture and etiquettes to be followed in the corporate world. The pedagogy used will be research, group discussions, flipped classrooms, continuous feedback, role-play and mentoring.					
<b>Course Objective</b>	The objective of the course is to <b>familiarize the learners with the concepts of “Being Corporate Ready” and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.</b>					
<b>Course Out Comes</b>	<b>On successful completion of this course the students shall be able to:</b> CO 1 <b>Recognize the fundamental nuances of Corporate Etiquette</b> CO2 <b>Express</b> thoughts/opinions in an acceptable manner in group discussions CO 3 <b>Demonstrate</b> effective presentation skills					
<b>Course Content:</b>						
<b>Module 1</b>	Presentation skills – practice and evaluation of individual presentation	Talk by Industry Expert+ Outbound Activity				<b>14 Sessions</b>
<b>Topics:</b> Presentation Skills, Opening Body & Closing Body, Audibility, Speech Clarity, Fluency, Voice Modulation, Non-verbal Communication and Body Language, Talk by Industry Expert-Outbound activity. <b>Activity:</b> Individual presentations (10 hours)						
<b>Module 2</b>	Group Discussions – Practice and feedback	Talk by Alumni				<b>8 Sessions</b>

<b>Topics:</b> Group Discussion techniques, Idea Generation, Mind Mapping, DEF, GOD, Action Plans for GD, Alumni Talk. <b>Activity:</b> Group Discussions				
<b>Module 3</b>	Corporate Etiquette	Role play+ Flipped classroom		<b>2 Sessions</b>
<b>Topics:</b> Do's and Don'ts in an Office Meeting, Handshake, Use of Business Card, Understanding Dress Code, Accessorizing Professionally, Telephone Etiquette, Interacting with Colleagues, Culture & Gender sensitization, Introduction to common tools at workplace for example CRM, POS, LMS, CANVA etc				
<b>Module 4</b>	Recap, Revision & Feedback session			<b>2 Sessions</b>
<b>Topics:</b> Revision of all the modules, overall feedback from the students about the syllabus.				
<b>Targeted Application &amp; Tools that can be used:</b> <ol style="list-style-type: none"> <li>1. TED Talks</li> <li>2. YouTube Links</li> <li>3. Videos by L&amp;D Team shared on Edhitch/YouTube.com</li> <li>4. LMS</li> </ol> <b>Assignments proposed for this course</b> <ol style="list-style-type: none"> <li>3. Evaluation of Presentation skills</li> </ol> YouTube Links: <a href="https://youtu.be/z__jxoczNWc">https://youtu.be/z__jxoczNWc</a> TED Talks: <a href="https://youtu.be/xkq8dr_5ofs">https://youtu.be/xkq8dr_5ofs</a>				
<b>References</b> <b>References</b> <ol style="list-style-type: none"> <li>7. Talk Like TED - The 9 Public-Speaking Secrets of the World's Top Minds By Carmine Gallo St. Martin's Press Copyright © 2014 Carmine Gallo All rights reserved. ISBN: 978-1-250-04112-8</li> <li>8. The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience MP3 CD – Import, 22 April 2014</li> <li>9. The Definitive Book of Body Language: The Hidden Meaning Behind People's Gestures and Expressions Hardcover – Illustrated, 25 July 2006</li> <li>10. Crucial Conversations: Tools for Talking When Stakes Are High Paperback – Import, 1 July 2002</li> <li>11. Priyadarshi Patnaik, “Group Discussion and Interview Skills”, Cambridge University Press India; Second edition (1 September 2015)</li> <li>12. The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success Paperback by Barbara Pachter – 16 August 2013</li> </ol> <b>Web links:</b> <ol style="list-style-type: none"> <li>1. <a href="http://www.forbes.com/sites/lisaquast/2014/04/07/office-etiquette-tips-to-overcome-bad-manners-at-work/">http://www.forbes.com/sites/lisaquast/2014/04/07/office-etiquette-tips-to-overcome-bad-manners-at-work/</a></li> <li>2. <a href="https://www.wordstream.com/blog/ws/2014/11/19/how-to-improve-presentation-skills">https://www.wordstream.com/blog/ws/2014/11/19/how-to-improve-presentation-skills</a></li> <li>3. <a href="https://www.cbs.de/en/blog/15-effective-presentation-tips-to-improve-presentation-skills/">https://www.cbs.de/en/blog/15-effective-presentation-tips-to-improve-presentation-skills/</a></li> </ol>				

**PPS3001 - Problem Solving through Aptitude**

<b>Course Code:</b> PPS3001	<b>Course Title: Problem Solving through Aptitude</b> <b>Type of Course: Practical Only Course</b>		<b>L- T-P- C</b>	0	0	2	1
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	Students should know the basic Mathematics & aptitude along with understanding of English						
<b>Anti-requisites</b>	Nil						
<b>Course Description</b>	The objective of this course is to prepare the trainees to tackle the questions on various topics and various difficulty levels based on Quantitative Ability, and Logical Reasoning asked during the placement drives. There will be sufficient focus on building the fundamentals of all the topics, as well as on solving the higher order thinking questions. The focus of this course is to teach the students to not only get to the correct answers, but to get there faster than ever before, which will improve their employability factor.						
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.						
<b>Course Outcomes</b>	On successful completion of the course the students shall be able to: CO1] <b>Recall</b> all the basic mathematical concepts they learnt in high school. CO2] <b>Identify</b> the principle concept needed in a question. CO3] <b>Solve</b> the quantitative and logical ability questions with the appropriate concept. CO4] <b>Analyze</b> the data given in complex problems.						
<b>Course Content:</b>							
<b>Module 1</b>	Quantitative Ability	Assignment	Bloom's Level : Application				<b>10 Hours</b>
Topics: Introduction to Aptitude, working of Tables, Squares, Cubes, Number Series, Wrong number series, Letter series.							
<b>Module 2</b>	Logical Reasoning	Assignment	Bloom's Level : Application				<b>20 Hours</b>
Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars							
<b>Targeted Application &amp; Tools that can be used:</b> Application area: Placement activities and Competitive examinations. Tools: LMS							
<b>Text Book</b> 1. Quantitative Aptitude by R S Aggarwal 2. Verbal & Non-Verbal Reasoning by R S Aggarwal							
<b>References</b> 1. <a href="http://www.indiabix.com">www.indiabix.com</a> 2. <a href="http://www.youtube.com/c/TheAptitudeGuy/videos">www.youtube.com/c/TheAptitudeGuy/videos</a> 3. <a href="http://Prepinsta.com">Prepinsta.com</a>							
<b>Topics relevant to Skill development:</b> Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.							

## Skill Enhancement Courses (SEC)

### CSA1001 Problem solving using C

CSA1001	Course Title: Problem solving using C Type of Course: Program Core Theory and Laboratory Integrated			L-T-P-C	2	0	4	4
Version No.	1.0							
Course Pre-requisites	Basic knowledge about the computer and its usage							
Anti-requisites	NIL							
Course Description	This Course will provide an introduction to foundational concepts of computer programming to students of BCA program. Topics covered in this Course are problem formulation and development of simple programs, Pseudo code, Flow Chart, Algorithms, data types, operators, decision making and branching, looping statements, arrays, functions, structures, Union, File handling and pointers. In the lab session students are required to solve problems based on the above concepts to illustrate the features of the structured programming							
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using C and attain Skill Development through Experiential Learning techniques.							
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Identify the solution to the problem through programming [Knowledge] CO2: Apply the basic concepts and control structures of programming to solve the problem. [Application] CO3: Interpret the concepts of array and strings to represent data and its operations. [Application] CO4: Demonstrate the concepts of functions, structures and unions in solving the related scenarios. [Application]							
Course Content:								
Module 1	Introduction to C Programming	Assignment	Case Studies	12 Sessions				
Topics: Introduction to C: Background, Computer basics, Problem solving techniques, Tokens, Input/ Output statements, Structure of C program.								
Module 2	Control statements in C	Assignment	Programming	20 Sessions				
Topics: Type Casting, Expression Evaluation, Conditional and unconditional statement, Looping statements								
Module 3	Arrays and Strings	Assignment	Mini Project	21 Sessions				
Topics: One dimensional Array, Array operations, 2D Array, 2D Array operations, Strings and its operations, String manipulation functions.								
Module 4	Functions, Structures and Unions, Pointers	Assignment	Programming	10 Sessions				
Topics: Categories of functions, concept of modular programming, user defined datatypes, structures, union, pointers, file handling								
<p>List of Laboratory Tasks:</p> <p>Basics of C Programming To Analyze the problem and draw the flowchart, Selecting the suitable data type Develop the program, identifying errors and rectifying them</p> <p>Programs on Branching statements, Programs on Looping Analyze the problem and draw the flowchart and selecting the branching or looping construct Develop the program. Identifying errors and rectifying them</p> <p>Programs on Arrays and Strings Analyze the problem and draw the flowchart and selecting suitable data storage type. Develop the program Identifying errors and rectifying them</p> <p>Programs on Functions, Programs on Structures &amp; unions, programs on Pointers Developing the solution using modular programming and usage of user defined datatype</p>								

Develop solutions using pointers concepts and modular programming

Text Book

E. Balaguruswamy, “Programming in ANSI C”, Eighth Edition - Tata McGraw Hill.

References Books

Behrouz A Forouzan, Richard F Gilberg, “Computer Science: A structured programming approach using C”, Third Edition Cengage Learning.

Brian W. Kernighan / Dennis Ritchie, “The C Programming Language “ ,Second Edition, Pearson

Yashavant Kanetkar, “Let Us C”, Eighteenth edition , BPB Publications

Web Links:

<https://www.coursera.org/learn/introduction-to-programming-in-c> (Coursera)

<https://presioniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE>

\_BASED&unique\_id=DOAJ\_1\_02082022\_1773 (E-Library Resource)

[https://onlinecourses.nptel.ac.in/noc22\\_cs32/preview](https://onlinecourses.nptel.ac.in/noc22_cs32/preview) (NPTEL)

Topics relevant to “SKILL DEVELOPMENT”:

Computer basics, type casting for **Skill development** through Experiential **Learning** techniques. This is attained through the assessment component mentioned in the course handout.

## CSA1002 Web Design and Development

Course Code: CSA1002	Course Title: Web Design and Development Type of Course: Laboratory integrated			L-T-P- C	1	0	4	3
Version No.	1.0							
Course Pre-requisites								
Anti-requisites	NIL							
Course Description	<p>This course is designed to build the student's knowledge on web design and development to an intermediate level. Students will learn the fundamental languages and markups for front-end web programming and back end languages. By the end of this course, students should be able to design, program and publish a working and aesthetic website. Students will also go through the process of working in a client/server side programming and learning skills which is necessary to successfully fulfill each role.</p> <p>The associated laboratory provides a platform to implement the various programming language to design web pages and enhance critical thinking and analytical skills.</p>							
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Web Design and Development and attain Skill Development through Experiential Learning techniques.							
Course Out Comes	<p>On successful completion of this course the students shall be able to:</p> <p>Design static and dynamic web pages using HTML, CSS and Java Script. [Application]</p> <p>Use JavaScript to write modern, reactive dynamic Websites (Client-side programming).[Application]</p> <p>Understand PHP language and use them while applying the principles of object oriented development .[Application]</p> <p>Design server-side programming on the web using PHP.[Application]</p>							
Course Content:								
Module 1	Introduction to HTML and CSS(Application)	Assignment	Programming activity					6 Hours
<p>Topics:</p> <p>Introduction to HTML: fundamentals of HTML elements, Document body, text, hyperlink, lists, tables, color and images, frames;</p> <p>Cascading Style Sheets: Introduction, defining your own styles, properties and values in styles, style sheets, formatting blocks, and layers.</p>								
Module 2	Designing of simple pages (Application)	Assignment	Programming activity					6 Hours
<p>Topics:</p> <p>JavaScript: JavaScript basics, variables, string manipulation, mathematical functions, statements, operators, arrays and functions. Objects in JavaScript: Data and objects in JavaScript, regular expressions, exception handling, built-in objects, events; Dynamic HTML with JavaScript: Data validation, opening a new window, Rollover buttons, moving images, multiple pages in a single download, floating logos.</p>								
Module 3	Server Side	Assignment	Programming activity					6 Hours

	Development (Application)			
<p>Topics: Introduction to PHP, variables, control statements, loops, Arrays, string handling, PHP forms, Global variables in PHP, Regular expression and pattern matching. State management in web applications, cookies, Application and session state. Basic database concepts, connecting to a My SQL database, retrieving and displaying results, modifying, updating and deleting data</p> <p>Errors Handling: Error Handling and Validation, What are errors and Exceptions?, PHP Error Reporting, PHP Error and Exceptions Handling</p>				
<p>List of Laboratory Tasks:  <a href="#">Lab sheet -1 [ 2 Practical Sessions]</a>  <b>Experiment No 1:</b>  <b>Level 1</b> –Design a simple web page with head, body and footer, with heading tags, image tag.  <b>Level 2</b> - Design a page to display the product information such as name, brand, price and etc with table tag.  <b>Experiment No. 2:</b>  <b>Level 1</b>–Design a web site for book information, home page should contain books list, when particular book is clicked, information of the books should display in the next page.  <b>Level 2</b> - Design a web page to capture the user information such as name, gender, mobile number, mail id, city, state, and country using form elements.  <a href="#">Lab sheet – 2 [2Practical Sessions]</a>  <b>Experiment No. 1:</b>  <b>Level 1</b> - Design a web page with nice formatting like background image, text colors and border for text using external CSS.  <b>Level 2</b> -JavaScript to perform mathematical calculations such as addition, subtraction, multiplication, and division using form elements  <b>Experiment No. 2:</b>  <b>Level 1</b>- Design a web page to display timer in the left side of the web page using Java Script.  <b>Level 2</b>- Design a web page to capture the student details such as student number, name, age, marks using Java Script Object.  <a href="#">Lab sheet – 3 [ 2 Practical Sessions]</a>  <b>Experiment No. 1:</b>  <b>Level 1</b> – JavaScript that calculates the Squares and Cubes of numbers from 0 to 10.  <b>Level 2</b> –Display the results in an HTML table format.  <b>Experiment No. 2:</b>  <b>Level 1</b> -JavaScript code that displays text “PRESIDENCY-UNIVERSITY” with increasing font size in the interval of 200ms in a color.  <b>Level 2</b> –When font reaches to 100pt it displays “School of Engineering” in a color. Then font size decreases to 10pt.  <a href="#">Lab sheet – 4 [ 2 Practical Sessions]</a>  <b>Experiment No. 1:</b>  <b>Level 1</b> - PHP program print the grade of student using marks  <b>Level 2</b> -PHP program to print the date in ten different formats  <b>Experiment No. 2:</b>  <b>Level 1</b> - PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.  <b>Level 2</b> -PHP program to display a digital clock which display the current time of the server.  <a href="#">Lab sheet -5 [2 Practical Sessions]</a>  <b>Experiment No. 1:</b>  <b>Level 1</b> - PHP program to sort the student’s records which are stored in the database using the SELECTION sort.  <b>Level 2</b> –Design an XML document to store information about a student in a college. The information must include USN, Name, Course name, Year of joining, and email id. Create a style sheet and use it to display document.</p>				

Targeted Application & Tools that can be used:

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Problem Solving: Choose appropriate web concepts to implement the web pages.

**Text Book**

HTML and CSS: The Comprehensive Guide, Jürgen Wolf, SAP Press; New edition (30 June 2023)

JAVASCRIPT THE DEFINITIVE GUIDE 7/ED, David Flanagan, Shroff/O'Reilly; Seventh edition (15 June 2020)

PHP & MySQL: Server-side Web Development, Jon Duckett, Wiley; 1st edition (April 12, 2022)

**References**

Deitel, Deitel, Goldberg, "Internet& World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

HTML & CSS QuickStart Guide, David DuRocher, ClydeBankMedia, 2021

JavaScript from Beginner to Professional, Laurence Svekis, Packt Publishing Limited (22 January 2021)

**Topics relevant to "SKILL DEVELOPMENT":**

HTML, Javascript, PHP for Skill development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.



**CSA1004      Programming in Python**

<b>Course Code:</b> CSA1004	<b>Course Title:</b> Programming In Python			<b>L-T-P-C</b>	1	0	4	3
	<b>Type of Course:</b> Theory & Integrated Laboratory							
<b>Version No.</b>	1.0							
<b>Course Pre-requisites</b>	Nil							
<b>Anti-requisites</b>	NIL							
<b>Course Description</b>	<p>This course provides the opportunity for the students of Computer Science engineering to develop Python scripts using its powerful programming features like lists, sets, tuples, dictionaries and sets. Students will also be introduced to object oriented programming concepts and packages for data visualization.</p> <p>Topics include: Basics of Python programming, operators and expressions, decision statements, loop control statements, functions, strings, lists, list processing : searching and sorting, nested list, list comprehension, tuples and dictionaries, sets, file handling, exception handling, object oriented programming concepts, modules and packages for data visualization</p>							
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using Python and attain <b>Skill Development</b> through <b>Experiential Learning</b> techniques.							
<b>Course Out Comes</b>	<p>On successful completion of the course the students shall be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate problem solving through understanding the basics of python (Application)</li> <li>2. Manipulate functions and data structures. (Application)</li> <li>3. Apply Tuple, Dictionaries, File and Exception Handling concepts to solve real time problems (Application)</li> <li>4. Practice object-oriented programming (Application)</li> <li>5. Produce data visualization using modules and packages (Application)</li> </ol>							
<b>Course Content:</b>								
<b>Module 1</b>	<b>Problem Solving Techniques and Basics of Python Programming</b>	assignments	Quizzes form basics of python					<b>15 Sessions</b>
Basics of problem solving techniques, Basics of Python programming, operators and expressions, decision statements, loop control statements.								
<b>Module 2</b>	<b>Function, String and List</b>	Quizzes and assignments	Comprehension based Quizzes and assignments					<b>20 Sessions</b>
Functions, strings, lists, list processing: searching and sorting, nested list, list comprehension								
<b>Module 3</b>	<b>Data Structures, File and Exception handling</b>	Term paper/Assignment	Quizzes form advanced python					<b>20 Sessions</b>
Tuples and dictionaries, sets, file handling, exception handling.								
<b>Module 4</b>	<b>Object-Oriented Programming and Data Visualization</b>	Term paper/Assignment	Application on data visualization					<b>20 Sessions</b>

Object oriented programming concepts, modules and packages for data visualization.

**List of Laboratory Tasks:**

Each Lab sheets experiments are prepared by level 0 and level 1 module wise.

**Targeted Application & Tools that can be used:**

Any IDE –PyCharm, VS Code, Python IDE, Spyder, jupyter note book, Google Colab

**Assignment:**

1. Write a python program to input 5 subject marks and calculate total marks, percentage and grade based on following criteria
  - i)percentage less than 50 (Grade C)
  - ii)percentage equal to 50 and less than 80 (Grade B)
  - iii)percentage equal to 80 and more than 80 (Grade A)
2. Write a python program to fetch only Email ID from text file which include following fields -:
  - i)Name
  - ii)Mobile Number
  - iii)Roll Number
  - iv)Email ID
3. Write a python script to answer the following questions:
  - i) What is the average molecular weight of an aminoacids?
  - ii) What is the total molecular weight and number of aminoacids of the P53 peptide GSRAHSSHLKSKKG QSTSRHK?
  - iii) What is the total molecular weight and number of aminoacids of the peptide YTSLIHSLIEESQNQQEK NEQELLELDKWASLWNWF?

**Text Book**

T1. Ashok NamdevKamthane and Amit Ashok Kamthane, “Problem Solving and Python Programming”, Tata McGraw Hill Edition, 2018.

T2. Charles Dierbach, “Introduction to Computer Science Using Python”, Wiley India Edition, 2015.

T3. ReemaThareja, “Python Programming Using Problem Solving Approach”, Oxford University Press, 2017.

**References**

R1. Balagurusamy, “Introduction to Computing and Problem-Solving Using Python”, Tata McGraw-Hill, 2016

R2. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson, 2017

**E-Resources:**

W1. <http://pythontutor.com/>

W2. <https://www.udemy.com/topic/python/>

W3. <https://in.coursera.org/courses?query=python>

W4: <https://puniversity.informaticsglobal.com/login>

**Topics relevant to “Skill Development”:** Concepts of problem solving techniques, Functions, Object oriented programming and data visualization for Skill Development through Experiential Learning techniques. This is attained through assessmentcomponent mentioned in course handout.

**CSAXXXX Object Oriented Programming using Java**

<b>Course Code:</b> CSAXXXX	<b>Course Title:</b> Object Oriented Programming using Java <b>Type of Course:</b> 1] Pure Lab	<b>L- T-P- C</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>
<b>Version No.</b>	2.0					
<b>Course Pre-requisites</b>	Nil					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	<p>The main objective is to learn the basic concept and techniques which form the object-oriented programming paradigm. Object-oriented programming is a new way of thinking about problem using models organized around real world concept.</p> <p>It investigates the software engineering principles of encapsulation, information hiding and code reuse, and discusses how these concepts are used to build abstract data types. The object oriented programming features of classes, inheritance, polymorphism and composition are studied, along with constructors and method overloading. Students implement Java programs incorporating features from the Java programming language.</p>					
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>Object Oriented Programming Using Java</b> and attain <b>Skill Development</b> through <b>Experiential Learning</b> techniques.					
<b>Course Out Comes</b>	<p>On successful completion of this course the students shall be able to:</p> <ol style="list-style-type: none"> <li>1. Discuss the OOP's concept and Apply the concepts to design, implement, compile, test and execute simple Java programs.[<b>Understand and Apply</b>]</li> <li>2. Explain the concepts related to classes and Use built-in methods of String and String Buffer classes. .[<b>Understand and Apply</b>]</li> <li>3. Implement concepts of Constructors, Polymorphism, Inheritance, Interfaces and Packages with programs.[<b>Understand, Analyse and Apply</b>]</li> <li>4. Understand and use the multithreading, exception handling mechanism and file handling mechanism of Java. [<b>Understand and Apply</b>]</li> <li>5. Design the GUI form using Applet and Swing components [<b>Create</b>]</li> </ol>					
<b>Course Content:</b>						
<b>Module 1</b>	Introduction to OOP : Class and Object (Comprehension)	Assignment	Programming activity	<b>18 Hours</b>		
Topics: Introduction to object-oriented programming, Java Evolution, How Java differs from C++, Features of Java, Java Program Development, Java Source File Structure, Compilation, Executions, JDK, JVM, JRE. Java Tokens: Datatypes, Variables, Operators, Control Statements. Classes, Objects, and Methods: Defining a class, Access Specifiers, instantiating objects, Reference variable, Accessing class members and methods, constructors, method overloading, Inner class and its types						
<b>Module 2</b>	Arrays, Strings , Extending Class (Comprehension)	Assignment	Programming activity	<b>18 Hours</b>		
Topics: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Strings: Operation on String, Mutable & Immutable String, Creating Strings using StringBuffer or StringBuilder. String Constant Pool, String Internal representation, String Application. Tokenizing a String. Inheritance and Polymorphism: Use and benefits of inheritance in OOP, Types of Inheritance, Method overriding, super keyword, Final, Polymorphism in inheritance, Abstract, this keyword.						

<b>Module 3</b>	Interface, Package and Exception Handling (Comprehension and Application)	Assignment	Programming activity	<b>18 Hours</b>
<p>Topics:          Defining interfaces, extending interfaces, implementing interfaces - Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, CLASSPATH Setting for Packages, Import and Static Import, Making Jar files for Library packages, Naming Convention for Packages.          Exception Handling: Introduction to Exceptions, Difference between Exceptions &amp; Errors, Types of Exception, Handling of Exceptions: Use of try, catch, finally, throw, throws, User Defined Exceptions, Checked and Un-checked Exceptions.</p>				
<b>Module 4</b>	Multithreaded Programming (Applications)	Assignment	Programming activity	<b>18 Hours</b>
<p>Topics:          Introduction to threads, life cycle of a thread, Creating Threads, Extending the Thread Class, Implementing the Runnable interface, priority of a thread, synchronization, Inter communication of Threads.          JAVA File I/O - Byte Stream - InputStream - OutputStream - FileInputStream - FileOutputStream - The Character Streams - Reader - Writer - FileReader - FileWriter</p>				
<b>Module 5</b>	Collection & GUI Programming (Comprehension)	Assignment	Programming activity	<b>18 Hours</b>
<p>Topics:          The Collection Framework : Collections of Objects , Collection Types, Sets , Sequence, Map, Understanding Hashing, Use of ArrayList&amp; Vector          Graphics Programming: Introduction, the abstract window toolkit (AWT), Layout managers, Frames, Panels, Drawing geometric figures, Keyboard Event and Mouse Event.          Creating User Interface: Introduction, describe various user interface Components: button, label, text field, text area, choice, list, check box.</p>				
<p><b>List of Laboratory Tasks:</b>  <b>Lab sheet -1 [ 5 Practical Sessions]</b>  <b>Experiment No 1:</b>  <b>Level1 -Programs using Control statements</b>→ Methods with Parameters, Methods with control statements  <b>Level2</b> - Demonstrations of Class, Object, Constructor, Static member, Encapsulation, Inner Class  <b>Experiment No. 2:</b>  <b>Level 1 – Simple Program for Understanding Arrays and Strings.</b>  <b>Level2</b> - Programs to implement array of objects, passing and returning objects as arguments.  <b>Lab sheet – 2 [2 Practical Sessions]</b>  <b>Experiment No. 1:</b>  <b>Level1 - Programs to demonstrate concepts of constructors and destructors</b>  <b>Level2</b> - Write a program to create a database for a bank account contains Name, Account no, Account type, Balance, Including the following – any constructor, destructor and methods to set and get information for 10 people.  <b>Experiment No. 2:</b>  <b>Level1 – Programs to implement methods of String and String Buffer Class.</b>  <b>Level2 - Programs to implement Inheritance and Polymorphism, Programs to implements Interface.</b>  <b>Lab sheet – 3 [3 Practical Sessions]</b>  <b>Level 1 - Programs to demonstrate Exceptions Handlers.</b></p>				

**Level 2 - Programs to implements nested handlers, Checked and Unchecked Exception Handlers.**

**Lab sheet – 4 [ 4 Practical Sessions]**

**Level 1 - Programs to implement Thread class and Runnable Interface.**

**Level 2 - Programs to implement priority, inter thread communication.**

**Level 3 - Programs to implement file handling mechanism.**

**Lab sheet –5 [ 1 Practical Session]**

**Experiment No. 1:**

**Level 1 - Programs to implement Collections (List, Set, Map).**

**Level 2 - Programs to implement Comparable and Comparator Interface , Lambda Notation**

**Lab sheet 6 [ 2 Practical Session]]**

**Experiment No. 1:**

**Level 1 – Programs to implement concepts of GUI.**

**Level 2 – Programs to create Registration form using Swing.**

**Targeted Application & Tools that can be used:** Notepad++, Eclipse IDE, NetBeans IDE

**Project work/Assignment: Mention the Type of Project /Assignment proposed for this course**

1] Programming: Implementation of given scenario using Java

### **Text Book**

1. Herbert Schildt, Java: The Complete Reference, Eleventh Edition (PROGRAMMING & WEB DEV- OMG), McGraw-Hill Education, 2019.  
E Balagurusamy, Programming with Java, 7th Edition, McGraw-Hill Education, 2020.

### **References**

1. Bruce Eckel, Thinking in Java. 4th ed.
2. R. Nageswara Rao, **Core Java: An Integrated Approach, New: Includes All Versions upto Java 8 2016.**
3. Brett McLaughlin, **Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D, DreamtechPress , 2016.**

### **Web References**

W1. NPTEL Course on “Java Programming”, Prof.DebasisSamanta,  
<https://archive.nptel.ac.in/courses/106/105/106105191/>

W2. “Head First Java” by Kathe Siera and Bert Bates, 2nd edition  
[https://www.rcsdk12.org/cms/lib/NY01001156/Centricity/Domain/4951/Head\\_First\\_Java\\_Second\\_Edition.pdf](https://www.rcsdk12.org/cms/lib/NY01001156/Centricity/Domain/4951/Head_First_Java_Second_Edition.pdf).

W3. “Building java programs”  
[https://presiuniv.knimbus.com/user#/searchresult?searchId=java%20programming&\\_t=1662620793642](https://presiuniv.knimbus.com/user#/searchresult?searchId=java%20programming&_t=1662620793642)

### **Topics relevant to “SKILL DEVELOPMENT”:**

**Interfaces, Exception Handling, Threads for Skill development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.**

## CSAXXXX Android Mobile Application Development

<b>Course Code:</b> CSAXXXX	Android Mobile Application Development			L- T-P- C	0	0	6	3
<b>Version No.</b>	2.0							
<b>Course Pre-requisites</b>	The student needs to have fundamental understanding of object-oriented programming concepts with Java/C#, XML, usage of any integrated development environment.							
<b>Anti-requisites</b>	Nil							
<b>Course Description</b>	<p>The course provides a basics of android platform and application life cycle. The goal of the course is to develop mobile applications with Android containing at least one of the following phone material components: GPS, accelerometer or phone camera, use simple GUI applications and work with database to store data locally or in a server.</p> <p>Topics include user interface design; user interface building; input methods; data handling; network techniques and URL loading; GPS and motion sensing. Android application framework and deployment. Power management, Screen resolution, Touch interface, Store data on the device.</p>							
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of Android Application Development and attain Skill Development through Experiential Learning techniques.							
<b>Course Out Comes</b>	<p>On successful completion of the course the students shall be able to:</p> <p>Discuss the fundamentals of mobile application development and architecture. [Understand]</p> <p>2. Illustrate mobile applications with appropriate android view. [Apply]</p> <p>3. Demonstrate the use of services, broadcast receiver, Notifications and content [Apply]</p> <p>4. Apply data persistence techniques, to perform CRUD operations. [Apply]</p> <p>5. Use advanced concepts for mobile application development. [Apply]</p>							
<b>Course Content:</b>								
<b>Module 1</b>	Introduction and Architecture of Android	Assignment	Simulation/Data Analysis	10 Sessions				
Android: History and features, Architecture, Development Tools, Android Debug Bridge (ADB), and Life cycle.								
<b>Module 2</b>	User Interfaces, Intent and Fragments	Assignment	Numerical from E-Resources	15 Sessions				
Views, Layout, Menu, Intent and Fragments.								
<b>Module 3</b>	Components of Android	Term paper/Assignment	Simulation/Data Analysis	15 Sessions				
Activities, Services, Broadcast receivers, Content providers, User Navigation								
<b>Module 4</b>	Notifications and Data Persistence	Term paper/Assignment	Simulation/Data Analysis	15 Sessions				
Notification, Shared Preferences, SQLite database, Android Room with a View, Firebase								
<b>Module 5</b>	Advance App Development	Term paper/Assignment	Simulation/Data Analysis	15 Sessions				

Graphics and Animation, Sensors, Performance, Location, Places, Mapping, Custom Views, Canvas.

### List of Laboratory Tasks

- 1.a. Design an app to read user inputs using edit text and display the result of arithmetic operations using toast message.
- 1.b. Create an android app to calculate the current age of yourself, select your DOB using date picker.
- 2.a. Design an app to input your personal information. Use autocomplete text view to select your place of birth.
- 2.b. Design an app to select elective course using spinner view and on click of the display button, toast your ID and selected elective course.
3. Design a restaurant menu app to print the total amount of orders.
4. Develop an android app that uses intent to maintain the following scenario.  
Check the eligibility criteria for voting. Input the Aadhar no., Name & age in the first activity. If the age is above 18, display the voter's detail in the second activity. Else, display, "You are not eligible to vote" in the second Activity.
5. Demonstrate the use of fragment with list of buttons representing various colors, and on click of these buttons, the appropriate color is filled in the next fragment.  
Create an Android application to input the vitals of a person (temperature, BP). If the vitals are abnormal, give proper notification to the user.
6. Create an android app to for movie ticket booking. Save the user name of the customer using shared preferences. After completion of booking, retrieve the username from the shared preferences and print the ticket details.
7. Create an android application to manage the details of students' database using SQLite. Use necessary UI components, which perform the operations such as insertion, modification, removal and view. Presidency University needs an APP for Admission eligibility checking for students, for that you need to take the following information from the Student: registration ID, physics, chemistry and mathematics marks (PCM), fees is allotted as below criteria.

PCM (Total marks %)	Fee concession
90 above	80 %
70 to 89	60 %
Below 69 %	no concession

  
On click on the button "Registration" details should be stored in the database using SQLite. Create button DISPLAY ALL (full students list) on click on the button it should display the students list per the fee concession.
8. A company need to design an app that plays soft music automatically in the background. Create an app to achieve this functionality.
9. Create an android application such that your view object in the Activity can be Animated with fade-in effect. Create an appropriate XML file named fade-in and write the application to perform the property animation.
10. Demonstrate how to send SMS and email.
11. Create an android application to transfer a file using WiFi. Create an android application "Where am I" with an Activity that uses the GPS Location provider to find the device's last known location.

### Targeted Application & Tools that can be used:

Android Studio, Visual Studio Code

### Assignment:

### Text Book

- T1. Dawn Griffiths, David Griffiths, "Head First Android Development", O'Reilly Media, 3<sup>rd</sup> edition, Nov 2021
- T2. Pradeep kothari "Android Application Development - Black Book", dreamtechpress
- T3. Barry Burd (Author), "Android Application Development" ALL – IN – ONE FOR Dummies
- T4. Jeff Mcherter (Author), Scott Gowell (Author), "Professional mobile Application Development" paperback, Wrox - Wiley India Private Limited
- T5. Wei-Meng Lee (Author) "Beginning Android Application Development" Wrox – Wiley India Private Limited

### References

Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3<sup>rd</sup> edition, 2017. The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"  
Erik Hellman, "Android Programming – Pushing the Limits", 1<sup>st</sup> Edition, Wiley India Pvt Ltd, 2014.

Dawn Griffiths and David Griffiths, “Head First Android Development”, 1st Edition, O’Reilly SPD Publishers, 2015.

J F DiMarzio, “Beginning Android Programming with Android Studio”, 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580

Anubhav Pradhan, Anil V Deshpande, “ Composing Mobile Apps” using Android, Wiley 2014, ISBN: 978-81-265-4660-2

Reto Meier “Professional Android Application Development”

#### E-Resources

<https://developers.google.com/certification/associate-android-developer/study-guide/android-core>

NPTEL course : [https://onlinecourses.swayam2.ac.in/nou21\\_ge41/preview](https://onlinecourses.swayam2.ac.in/nou21_ge41/preview)

<https://www.coursera.org/specializations/android-app-development>

<https://www.coursera.org/learn/introduction-to-android-mobile-application-development>

#### Topics relevant to “SKILL DEVELOPMENT”:

SQLite database, Android Room with a View for Skill development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.



**CSAXXXX UI/UX Design**

<b>Course Code:</b> CSAXXXX	<b>Course Title:</b> UI/UX Design  <b>Type of Course:</b> Lab Only Course	<b>L-T-P- C</b>	0	0	6	3
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	Nil					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	<p>The UI/UX Design brings a design-centric approach to user interface and user experience design, and offers practical, skill-based instruction centered on a visual communications perspective, rather than on one focused on marketing or programming alone.</p> <p>User interface and user experience design is a high-demand field, but the skills and knowledge you will learn in this Specialization are applicable to a wide variety of careers, from marketing to web design to human-computer interaction. The course is foundational and hands-on learning in using popular design tools such as Figma.</p>					
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>UI/UX Design</b> and attain <b>Employability Skills</b> through <b>Experiential Learning techniques</b> .					
<b>Course Out Comes</b>	CO1 : Explain the UX Design principles [Understand] CO2 : Summarize the ideal user experience. [Understand] CO3 : Develop wireframes using digital tools [Apply] CO4 : Construct personas and evaluate designs [Apply]					

<b>Course Content:</b>				
<b>Module 1</b>	<b>Introduction to UI/UX</b>	assignments	Quizzes	<b>20 Sessions</b>
Introduction to User Experience, Importance of UX-design, Different sub- disciplines within UX, job opportunities in UX field/domain. RoI, KPI, Stakeholders of UX team, trade-offs, UX Design definition. Basics of Interaction Design, User Research, Visual Design, Motion Design.				
<b>Module 2</b>	<b>Users and User Centered Design</b>	Quizzes and assignments	Comprehension based Quizzes and assignments	<b>20 Sessions</b>
Users and end users, User Centered design framework, 7 principles of UX design, 4 stages of user centered design, 5-elements framework. Design thinking process, Lean UX, Double Diamond, designing for the next billion users, designing for multiple platforms, the four Cs of designing for multiple platform				
<b>Module 3</b>	<b>Design methodologies</b>	Term paper/Assignment	Quizzes	<b>20 Sessions</b>
Universal design, 7 principles of universal design, inclusive design and accessible design, and equity-focused design. Equality and equity. Designing for accessibility, Lenses of Accessibility, assistive technology, design sprints. Wireframing, importance of wireframing. Compatibility with wearable devices.				
<b>Module 4</b>	<b>Personas, developing mockups using Figma</b>	Term paper/Assignment	Classification	<b>30 Sessions</b>
Basics of personas, creating personas, perspectives on personas. Gestalt principles of perception, Usability Testing, acceptance testing, creating mockups and prototypes in Figma.				
<b>List of Laboratory Tasks:</b>				
Experiment No. 1: Installation and Interface of Balsamiq and/or Figma				
Level 1: Ensure that both Balsamiq and Figma are up and running with user accounts.				
Level 2: Download and import design files from internet to familiarize with them.				
Experiment No. 2: Create wireframe of the login screen of a mobile app				
Level 1: Make first wireframe of one login page				
Level 2: Make two pages that are hyperlinked and critique the design				
Experiment No. 3: Final wireframe experiment.				
Level 1: Prepare the wireframe of all the pages of a selected website				
Level 2: Change the wireframe to make the design changes to the website				
Experiment No. 4: First Figma experiment.				
Level 1: Figma interface, shortcuts and tools.				
Level2: Create and move between frames.				
Experiment No. 5: Design App Screen				
Level 1: Create layout, layers, fill colours				

Level 2: Set layer opacity, lock and unlock layers

Experiment No. 6: Logo and icon

Level 1: Boolean operations on shapes, pen tool

Level2: Make smiley face

Experiment No.7: Create an app face.

Level1: Insert image, design nav bar using logo and icons

Level 2: Duplicate frame

Experiment No.8: Create a prototype

Level1: Use designing and prototyping modes

Level 2: Create connections between frames and layers

Experiment No.9: Create prototype of food delivery app

Level1: Replicate inner pages of app

Level 2: Improve the inner page design

Experiment No.10: Create prototype of a desktop website

Level1: Replicate pages on desktop app

Level 2: Export files and share in LinkedIn

**Targeted Application & Tools that can be used:**

**Application Area:** Designing user interfaces and user experience for software applications

**Professionally Used Software:** Balsamiq, Figma

**Assignment:**

1. Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

**Text Book**

1. Chesnut D., Nichols K.P., 'UX for Dummies', Wiley Publications, 2021.
2. Fabio Staiano, "Designing and Prototyping Interfaces with Figma: Learn essential UX/UI design principles", Packt Publishing,

**References**

- 1.Nick de Voil, 'User Experience Foundations', The Chartered Institute for IT, 2020.
- 2.Morris, Jason, 'Hands-On Android UI Development : Design and Develop Attractive User Interfaces for Android Applications', Packt Publishing, 2017.

## CSA3005 Internet of Things

Course Code: CSA3005	Course Title: Internet of Things			L- T-P- C	1	0	4	3
	Type of Course: Integrated							
Version No.	2.0							
Course Pre-requisites	1. Students should know basic python programming. 2. Students have basic knowledge basic electronic components such as sensors – temperature, motion, pressure, and actuators etc. 3. Students should have basic idea about Cloud and its uses.							
Anti-requisites	NIL							
Course Description	The Internet of Things (IoT) is an emerging paradigm combining heterogeneous devices at an unprecedented scale, thereby enabling individuals and organizations to gain greater value from networked connections among people, processes, data, and things. The Internet of Things (IoT) is a course of objects interacting with people, with information systems, and with other objects. The course will focus on creative thinking, IoT concepts & IoT technologies.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Internet of Things and attain Skill Development through Experiential Learning techniques.							
Course Out Comes	On successful completion of the course the students shall be able to: 1.Explain building blocks of Internet of Things and characteristics. [UNDERSTANDING] 2.Define IoT Protocols. [REMEMBERING] 3.Identify and demonstrate use of IoT devices for Real Time applications. [APPLICATION]							
Course Content:								
Module 1	INTRODUCTION TO INTERNET OF THINGS	Assignment	Simulation /Data Analysis	16 Sessions				
Introduction, Definition & Characteristics of IOT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical design of IoT- IoT functional blocks, Applications of IoT Communication Model & concepts, IoT Communication APIs, IoT Enabling Technologies- Wireless sensor networks, Cloud computing .								
Module 2	IOT COMMUNICATION MODEL AND PROTOCOLS	Assignment	Numerical from E-Resources	18 Sessions				
:6LoWPAN,IEEE802.15.4,Zigbee, WirelessHART,Z-Wave, ISA100, NFC,RFID, RFID:Introduction,PrincipleofRFID,ComponentsofanRFID system.								
Module 3	IOT IMPLEMENTATION USING PROTOTYPING PLATFORMS & TOOLS	Term paper/Assignment	Simulation /Data Analysis	21 Sessions				
Communication/Transport Protocols: Understanding the Arduino IDE - Installing and Setting up the Arduino IDE - Connecting the Arduino IDE with devices .Bluetooth. Data Protocols: Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Advanced Message Queuing Protocol (AMQP), XMPP – Extensible Messaging and Presence Protocol.IoT Solutions using Arduino/Raspberry Pi.								
<b>List of Laboratory Tasks</b>								
1 Installation of arduino IDE & Arduino program to implement scrolling LED, to glow even/odd LED 2 Arduino program to demonstrate usage of push button to control the LED 3 Arduino program to demonstrates traffic control system 4 Arduino program to demonstrates usage of servo motor with potentiometer 5 Installation of Raspberry pi software 6 Working basic commands on Raspberry pi & to demonstrate remote logging in raspberry pi 7 Raspberry pi program to implement blinking LED 8 Raspberry pi program to implement camera module for video 9 Raspberry pi program to obtain the temperature using DHT sensors 10 Using a Raspberry Pi with distance sensor (ultrasonic sensor HCSR04) 11 Raspberry pi program to implement Garage spot light								

**Targeted Application & Tools that can be used:**

Interfacing of ARDUINO UNO and Raspberry pi for developing smart CITIES

Tools:

Tinkercad for Circuit designing using Arduino Uno

Ubidots Cloud

Thingspeak Cloud

**Assignment:**

Mini Project will be there in place of Assignment

**Text Book**

T1 ArshdeepBagha, Vijay Madiseti, Internet of Things A hands on approach, First Edition, Universities Press, 2018

**References**

R1 Vinit Kumar Gunjan, MohdDilshadAnsari, Mohammed Usman, ThiDieuLinh Nguyen Internet of Things Technology, Communications and Computing Springer January 2023

R2 Dr. Hassan Internet of Things A to Z: Technologies and Applications IEEE Press 2018

R3 Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 2021, 1st edition, McGraw Hill Education, USA.

Web Based Resources and E-books:

W1. NPTEL: <https://nptel.ac.in/courses/106106127>

W2. [https://presiuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=grid&sortFieldId=none&topresult=false&content=\\*cloud\\*](https://presiuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=grid&sortFieldId=none&topresult=false&content=*cloud*)

<https://www.arduino.cc/>

<https://www.raspberrypi.org/>

(iii) Additional web-based resources

a) [https://onlinecourses.nptel.ac.in/noc22\\_cs53/preview](https://onlinecourses.nptel.ac.in/noc22_cs53/preview)

b) <https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>

**Topics relevant to “SKILL DEVELOPMENT”:**

Applications of IoT Model and Communication for Skill development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

**CSA3100 Summer Internship**

<b>Course Code:</b> CSA3100	<b>Course Title:</b> Summer Internship <b>Type of Course:</b> Internship	<b>L- T-P- C</b>	-	-	-	3
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	Knowledge and Skills related to all the courses studied in previous semesters.					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	The Summer Internship course provides students with hands-on industry experience by engaging them in real-world projects related to their field of study. This course allows students to apply theoretical knowledge to practical scenarios, enhancing their technical, problem-solving, and professional skills.					
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of Summer Internship and attain Employability Skills through Experiential Learning techniques.					
<b>Course Outcomes</b>	<p>On successful completion of this course the students shall be able to:</p> <ol style="list-style-type: none"> <li>1. Analyze real-world industry challenges and apply domain-specific knowledge to develop solutions in a professional work environment. (Analyze)</li> <li>2. Evaluate and implement software development methodologies, project management strategies, or technical workflows based on industry standards and best practices. (Evaluate)</li> <li>3. Create a structured internship report and present findings effectively, demonstrating technical proficiency, teamwork, and problem-solving skills. (Create)</li> </ol>					

## CSA3101 - Internship

<b>Course Code:</b> CSA3101	<b>Course Title:</b> Internship <b>Type of Course:</b> Internship	<b>L- T-P- C</b>	-	-	-	04
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	Knowledge and Skills related to all the courses studied in previous semesters.					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	<p>The <b>Internship</b> course provides students with practical industry exposure, enabling them to apply theoretical knowledge to real-world scenarios. Through hands-on experience in a professional environment, students develop technical skills, problem-solving abilities, and workplace competencies.</p> <p>During the internship, students will:</p> <ul style="list-style-type: none"> <li>• Work on <b>industry-relevant projects</b> under the guidance of professionals.</li> <li>• Apply <b>domain-specific knowledge</b> to solve real-world challenges.</li> <li>• Develop <b>technical, analytical, and professional skills</b> required for the industry.</li> <li>• Gain insights into <b>workplace culture, project management, and collaboration</b>.</li> <li>• Document their experiences through <b>internship reports and presentations</b>.</li> </ul> <p>By the end of this course, students will have <b>enhanced their employability</b>, gained practical experience, and built a foundation for future career opportunities.</p>					
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of <b>Internship</b> and attain Employability <b>Skills</b> through Experiential <b>Learning</b> techniques.					
<b>Course Outcomes</b>	<p>On successful completion of this course the students shall be able to:</p> <ol style="list-style-type: none"> <li>1. <b>Apply</b> theoretical knowledge to solve real-world problems in an industry setting. <i>(Apply)</i></li> <li>2. <b>Analyze</b> industry-specific workflows, tools, and technologies to enhance technical proficiency. <i>(Analyze)</i></li> <li>3. <b>Evaluate</b> project requirements, challenges, and solutions while adhering to industry standards and best practices. <i>(Evaluate)</i></li> <li>4. <b>Create</b> a professional report and <b>present</b> key learnings, demonstrating effective communication and teamwork skills. <i>(Create)</i></li> </ol>					

**Core Courses (CC)**

**MAT2007 Applied Mathematics**

<b>Course Code:</b> MAT2007	<b>Course Title:</b> Applied Mathematics  <b>Type of Course:</b> School Core	<b>L- T-P- C</b>	3	0	0	3
<b>Version No.</b>	2.0					
<b>Course Pre-requisites</b>	Nil					
<b>Anti-requisites</b>	Nil					
<b>Course Description</b>	The course provides an overview of the fundamental ideas of trigonometry and analytical geometry keeping in mind the geometrical approach to solving real-world problems. The course provides insights into the deeper aspects of differential calculus and its applications. It also covers various methods of integration and their significance. In addition, the course highlights the importance of matrix techniques and their advantages.					
<b>Course Objective</b>	The objective of the course is to <b>familiarize the learners with the concepts of “ Applied Mathematics” and attain <u>Skill Development</u> through <u>Problem Solving techniques</u>.</b>					
<b>Course Outcomes</b>	On successful completion of the course the students shall be able to: CO1: Understand the basic principles of trigonometry and analytical geometry and their applications. CO2: Comprehend the concepts of differential calculus and its applications. CO3: Explain various methods of integration and their advantages. CO4: Apply matrix techniques to solve system of linear equations.					
<b>Course Content:</b>						
<b>Module 1</b>	<b>Trigonometry and Analytical Geometry</b>					<b>10 classes</b>
Introduction, trigonometric ratios, transformations, identities, inverse trigonometric functions (only elementary topics). Scalar product, vector product, angle between two vectors, shortest distance between two lines, conditions for two lines to intersect, point of intersection, collinearity of three points (self- study topics). Direction ratios, direction cosines of a line passing through two points, equation of a line in space, angle between two lines, shortest distance between two lines, plane, equation of a plane in normal form.						
<b>Module 2</b>	<b>Differential Calculus</b>					<b>12 classes</b>
Limit, continuity, differentiability, Test of convergence, Rolle’s Theorem, Mean value theorems (Cauchy’s and Lagrange’s), Power series expansions of functions in Taylor’s and Maclaurin’s forms; indeterminate forms and L'Hospital's rule.						
<b>Module 3</b>	<b>Integral Calculus</b>					<b>10 classes</b>



Integral as limit of sum, fundamental theorem of calculus, indefinite integrals, methods of Integration: substitution method, integration by parts and by partial fraction technique.

<b>Module 4</b>	<b>Matrices</b>		<b>12 classes</b>
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Matrices, types of matrices, elementary properties of matrices, inverse matrices, rank of a matrix, symmetric, skew symmetric and orthogonal matrices, system of linear equations, Gauss elimination method.

**Targeted Application & Tools that can be used:**

Applied Mathematics provides the mathematical foundations for technological engineering, scientific computing, management science, operations research, statistics, actuarial science, mathematical economics and the like.

Tools used: Mathematica / Matlab / Maple

**Project work/Assignment:**

Assignment 1: Trigonometry and Analytical Geometry.

Assignment 2: Differential and Integral Calculus.

Assignment 3: Matrix Techniques.

**Text Books:**

1. Hugh Neill, Trigonometry: A complete Introduction, John Murray Learning, 2018.
2. George B. Thomas and Ross L. Finney, Calculus and Analytical Geometry, Addison-Wesley, 9<sup>th</sup>Edn, 1998.
3. Ron Larson, Elementary Linear Algebra, Brooks/Cole Cengage Learning, 7<sup>th</sup>Edn., 2015.

**References**

1. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc. 10<sup>th</sup> Edition.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44<sup>th</sup> Edition, 2010.
3. David C. Lay, Linear Algebra and its Applications, 3<sup>rd</sup> Ed., Pearson Education Asia, Indian Reprint, 2007.
4. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.
5. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4<sup>th</sup> Ed., Prentice Hall, 2020.
6. A.I. Kostrikin, Introduction to Algebra, Springer Verlag, 1984.
7. Richard Bronson, Theory and Problems of Matrix Operations, Tata McGraw Hill, 1989.
8. Ron Larson, Trigonometry, Brooks/Cole Cengage Learning, 11<sup>th</sup>Edn, 2020.
9. Robert E. Moyer, Trigonometry, Mc. Graw Hill, Addison-Wesely, 4<sup>th</sup> Edition, 2009.

**Topics relevant to SKILL DEVELOPMENT:** The course provides an overview of the fundamental ideas of trigonometry and analytical geometry keeping in mind the geometrical approach to solving real-world problems. The course provides insights into the deeper aspects of differential calculus and its applications for **Skill Development through Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

**E-Resources (<https://presiuniv.knimbus.com>)**

1. <https://openFullText.html?DP=https://directory.doabooks.org/handle/20.500.12854/52889>
2. <https://openFullText.html?DP=https://open.umn.edu/opentextbooks/textbooks/92>
3. <https://openFullText.html?DP=https://open.umn.edu/opentextbooks/textbooks/178>

**Web Resources**

1. <https://www.pdfdrive.com/analytic-geometry-and-calculus-with-vectors-e18904408.html>
2. <https://www.pdfdrive.com/calculus-and-analytic-geometry-9th-edition-e184473689.html>
3. <https://www.pdfdrive.com/calculus-with-analytic-geometry-e35951356.html>

**Video Lectures**

1. [https://www.youtube.com/watch?v=k\\_MzQjLA9fA](https://www.youtube.com/watch?v=k_MzQjLA9fA)
2. <https://www.youtube.com/watch?v=BzxvLSkrd90>
3. <https://www.youtube.com/watch?v=WsQQvHm4lSw>
4. <https://archive.nptel.ac.in/courses/111/106/111106146/>

## ECE2009 Digital Computer Fundamentals

Course Code: ECE2009	Course Title: Digital Computer Fundamentals Type of Course: Program Core& Theory& Integrated Laboratory			L-T-P- C	2	0	2	3
Version No.	1.0							
Course Pre-requisites	Basic concepts of number representation, Boolean Algebra, Arithmetic and Logic Computation.							
Anti-requisites	NIL							
Course Description	<p>The purpose of this course is to enable the students to appreciate the fundamentals of digital logic circuits and Boolean algebra focusing on both combinational and sequential logic circuits. This course is analytical in nature and needs a fundamental knowledge on logical computation with Boolean Algebra. The focus of the course will be to discuss the minimization techniques for making canonical and low-cost digital circuit implementations. In this course we emphasize on analysis and design of digital electronic circuits. Additionally, this course will create a foundation for future courses includes Computer Architecture, Microprocessors, Microcontrollers, and Embedded Systems etc.</p> <p>The course also enhances the Design, Implementation and Programming abilities through laboratory tasks. The associated laboratory provides an opportunity to verify the theoretical knowledge.</p>							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Computer Fundamentals and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.							
Course Outcomes	<p>On successful completion of this course the students shall be able to:</p> <p>Apply minimization techniques to simplify Boolean expressions.</p> <p>Demonstrate the Combinational circuits for a given logic.</p> <p>Illustrate the Sequential logic circuits.</p> <p>Implement various combinational logic circuits using gates.</p> <p>Verify the performance of various sequential logic circuits using gates and memory elements.</p>							
Course Content:								
Module 1	Boolean function simplification	Assignment	Programming and Simulation task	10 Session				
<p>Topics:</p> <p>Review of Number systems and logic gates, Number base conversions, Overview of Boolean functions and simplifications, two, three, four variable K-Maps- Don't care conditions- Both SOP and POS- Universal Gates (NAND &amp; NOR) Implementations.</p>								
Module 2	Combinational Logic circuits	Assignment	Programming and Simulation task	10 Session				
<p>Topics:</p> <p>Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Parity generator and checker, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders.</p>								
Module 3	Sequential and Programmable logic circuits	Assignment	Programming and Simulation task	10 Session				
<p>Topics:</p> <p>Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy &amp; Moore Models of finite state machines - Registers &amp; Counters.</p>								
<p>List of Laboratory Tasks:</p> <p>Experiment No 1: Verify the Logic Gates truth table</p> <p>Level 1: Verify basic logic gates on Digital Logic simulator.</p> <p>Level 2: Construct basic logic gates using universal gates and verify using Digital Logic Simulator</p>								

**Experiment No. 2:** Construct and verify 2-bit and 3-bit adder and subtractor logic circuits

**Level 1:** By using basic logic and XOR gates on Simulator

**Level 2:** By using Universal logic gates on Simulator

**Experiment No. 3:** Construct and verify the Multiplexer and Demultiplexer logic circuits

**Level 1:** By using basic logic and XOR gates on Simulator

**Level 2:** By using Universal logic gates on Simulator.

**Experiment No. 4:** Construct and verify the Encoder and Decoder logic circuits

**Level 1:** By using basic logic gates on Simulator

**Level 2:** Design and simulate Priority encoder.

**Experiment No. 5:** Construct and verify the combinational logic circuit for given specifications.

**Level 1:** Specifications given in the form of Truth table. Implement using basic gates.

**Level 2:** Specification should be extracted from the given scenario. Implement using universal gates only.

**Experiment No. 6:** Study of Flip flops

**Level 1:** Verify the operation of Flip-Flops on Digital Logic Simulator

**Level 2:** Conversion of one FF to another and verify on Digital Logic Simulator.

**Experiment No. 7:** Construct and verify the synchronous counter circuit.

**Level 1:** 3-Bit up counter using JK excitation table.

**Level 2:** Specification should be extracted from the given scenario and design.

**Experiment No. 8:** Construct and verify the Asynchronous counter circuit.

**Level 1:** 3-Bit up counter.

**Targeted Application & Tools that can be used:**

Application Area includes all modern electronic devices (cellular phones, MP3 players, laptop computers, digital cameras, high-definition televisions, Home Automation, Communication systems). The students will be able to join a profession which involves basics to high level of digital circuit design and analysis.

Professionally Used Software: MultiSim Simulator

Besides these software tools Digital IC Trainer kit and Integrated Circuits (ICs) can be used to perform circuit testing and analysis.

**Text Book(s):**

Thomas L. Floyd, "Digital Fundamentals", Eleventh Edition, Pearson Education. ISBN-10: 132737965. (2014)  
eBook-[\[PDF\] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org](#).

**Reference(s):**

**Reference Book(s):**

Mano, M. Morris and Ciletti Michael D., "Digital Design", 5<sup>th</sup> Edition, Pearson Education.

{[\[PDF\] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download \(studymaterialz.in\)](#)}

Jain, R. P., "Modern Digital Electronics", 4<sup>th</sup> Edition, McGraw Hill Education (India).

Roth, Charles H., Jr and Kinney Larry L., "Fundamentals of logic Design", 7<sup>th</sup> Edition, Cengage Learning.

**Online Resources (e-books, notes, ppts, video lectures etc.):**

NPTEL Course- "Digital Electronics Circuits" by Prof. GowthamSaha, Dept of ECE, IIT Kharagpur, [NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits](#)

Digital Logic Design Lectures PPT [Slide 1 \(iare.ac.in\)](#)

Digital Design Lab Tutorial Links: [Multisim Tutorial for Digital Circuits - Bing video](#)

[CircuitVerse - Digital Circuit Simulator online](#)

[Learn Logisim ➡ Beginners Tutorial | Easy Explanation! - Bing video](#)

[Digital Design 5: LOGISIM Tutorial & Demo](#)

[Presidency university link- https://presiuniv.knimbus.com/user#/home](https://presiuniv.knimbus.com/user#/home)

**E-content:**

1. Z. Xin-Li and W. Hong-Ying, "The Application of Digital Electronics in Networking Communication," 2016 Eighth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168.  
[https://www.researchgate.net/publication/339975715\\_Study\\_and\\_Evaluation\\_of\\_Digital\\_Circuit\\_Design\\_Using\\_Evolutionary\\_Algorithm](https://www.researchgate.net/publication/339975715_Study_and_Evaluation_of_Digital_Circuit_Design_Using_Evolutionary_Algorithm)
2. An encoding technique for design and optimization of combinational logic circuit DipayanBhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;Kazuyuki Murase2010 13th International Conference on Computer and Information Technology (ICCIT).  
<https://ieeexplore.ieee.org/document/5723860>
3. A. Matrosova and V. Provkina, "Applying Incompletely Specified Boolean Functions for Patch Circuit Generation," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, DOI: 10.1109/EWDTS52692.2021.9581029.  
<https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.951.2860&rep=rep1&type=pdf>
4. <https://presiuniv.knimbus.com/user#/home>

Topics relevant to "SKILL DEVELOPMENT": Adders, Multiplexers, Decoders / Encoders; Flip-Flops, Counters and Registers for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

**MAT1006 Statistical Methods and Techniques**

<b>Course Code:</b> MAT1006	<b>Course Title:</b> Statistical Methods and Techniques		<b>L- T- P- C</b>	3	0	0	3
<b>Type of Course:</b>							
<b>Version No.</b>	2.0						
<b>Course Pre-requisites</b>	Nil						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	To acquaint students with various statistical methods. To cultivate statistical thinking among students. To prepare students for future courses having quantitative components.						
<b>Course Objective</b>	The objective of the course is to <b>familiarize the learners with the concepts of “Statistical Methods and Techniques”</b> and attain <b>Skill Development Through Problem Solving techniques</b> .						
<b>Course Outcomes</b>	<p>On successful completion of this course the students shall be able to:</p> <p>CO1: <b>Recognize</b> the different techniques of graphical representation of statistical data.</p> <p>CO2: <b>Predict</b> the characteristics of statistical data with the help of measures of central tendency, dispersion, correlation and regression.</p> <p>CO3: <b>Interpret</b> the symmetry of a data set with the help of measures of skewness and kurtosis.</p> <p>CO4: <b>Employ</b> suitable formulae for solving problems pertaining to the basic probability, additive and multiplicative laws for both independent and dependent events.</p>						
<b>Course Content:</b>							
<b>Module 1</b>	<b>Data distribution and Concepts of Central Tendency and Dispersion</b>						15 classes
<p>Statistics, Importance of Statistics, Data: Primary and secondary data, Types of data: unclassified, ungrouped and grouped data, Visual Representation of data: Bar chart- simple, sub-divided, component, percentage, Histogram, Frequency polygon, Frequency curve, Cumulative Frequency Curve, Pie Chart – Interpretation and Examples.</p> <p>Introduction to Central Tendency, Mean – Arithmetic Mean, Positional averages: quartiles, deciles and percentiles, Mode for unclassified, grouped and ungrouped data- Interpretation and Examples.</p> <p>Introduction to Measures of Dispersion, Range, Quartile Deviation, Variance, Standard Deviation and Coefficient of variation – Interpretation and Examples.</p>							
<b>Module 2</b>	<b>Skewness, moments and Kurtosis</b>						10 classes

Introduction to Skewness, absolute measure of skewness, Relative measures of skewness- Karl Pearson's Coefficient of skewness, Bowley's coefficient of skewness, Introduction to moments, moments about mean, moments about arbitrary point, moments about zero, relationship between central and non-central moments, Sheppard's correction of moments, Introduction to Kurtosis, measures of kurtosis - Interpretation and Examples.

<b>Module 3</b>	<b>Correlation and Regression</b>			10 classes
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Introduction to Covariance, Correlation, Rank Correlation, Karl Pearson's correlation coefficient, standard error of correlation coefficient, Regression Analysis – Examples.

<b>Module 4</b>	<b>Probability</b>			10 classes
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Introduction - Random Experiment, Sample space and events, Probability of an event, Properties, Addition principle, conditional probability, Multiplication law, Bayes theorem and problems.

**Targeted Application & Tools that can be used:**

Organize, manage and present data.  
 Translate real-world problems into probability models.  
 Analyze Statistical data using MS-Excel/SPSS/R software

**Project work/Assignment:**

Assignment 1: Correlation and Regression.  
 Assignment 2: Bayes theorem problems.

**Text Books**

1. S. C. Gupta, Fundamentals of Statistics, 7<sup>th</sup> Edition, Himalaya Publishing House
2. Schaum Series – Statistics and Probability, McGraw Hill Publications.

**References**

1. Berenson and Levine, Basic Business Statistics, New Jersey, 6th edition, Prentice- Hall India, 1996.
2. D.C. Montgomery and G. C. Runger, Applied Statistics and Probability for engineers, New Jersey, John Wiley and Sons, 3rd edition, 2003.

**Topics relevant to SKILL DEVELOPMENT:** To acquaint students with various statistical methods. To cultivate statistical thinking among students. To prepare students for future courses having quantitative components for **Skill Development through Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

**CSA2101 Data Structures and Algorithms**

<b>Course Code:</b> CSA2100	<b>Course Title:</b> Data Structures and Algorithms Lab <b>Type of Course:</b> Pure Lab	<b>L- T-P- C</b>	0	0	2	1
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	Problem Solving Using C					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This course introduces the fundamental concepts of data structures and to emphasize the importance of choosing an appropriate data structure and technique for program development. This course has theory and lab component which emphasizes on understanding the implementation and applications of data structures using Java programming language. With a good knowledge in the fundamental concepts of data structures and practical experience in implementing them, the student can be an effective designer, developer for new software applications.					
<b>Course Objective</b>	The objective of the course is <b>SKILL DEVELOPMENT</b> of student by using <b>EXPERIENTIAL LEARNING</b> techniques					
<b>Course Out Comes</b>	<p><b>On successful completion of the course the students shall be able to:</b></p> <p><b>CO1:</b> Implement program for given problems using fundamentals of data structures. ]Application[</p> <p><b>CO2:</b> Apply an appropriate linear data structure for a given scenario. ]Application[</p> <p><b>CO3:</b> Apply an appropriate non-linear data structure for a given scenario. ]Application[</p> <p><b>CO4:</b> Explain the performance analysis of given searching and sorting algorithms. ]Application[</p>					
<b>Course Content:</b>						
<b>Module 1</b>	<b>Introduction to Data Structure and Linear Data Structure – Stacks and Queues</b>	Assignment	Program activity			<b>8 Sessions</b>
<p><b>Introduction</b> – Introduction to Data Structures, Types and concept of Arrays.</p> <p><b>Stack</b> - Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.</p> <p><b>Queues</b> - Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.</p>						
<b>Module 2</b>	<b>Linear Data Structure- Linked List</b>	Assignment	Program activity			<b>8 Sessions</b>
<p><b>Topics: Linked List</b> - Singly Linked List, Operation on linear list using singly linked storage structures, Circular List, Applications of Linked list.</p> <p><b>Recursion</b> - Recursive Definition and Processes, Programming examples.</p>						

<b>Module 3</b>	<b>Non-linear Data Structures - Trees and Graph</b>	Assignment	Program activity	<b>8 Sessions</b>
<p><b>Topics: Trees</b> - Introduction to Trees, Binary tree: Terminology and Properties, Use of Doubly Linked List, Binary tree traversals: Pre-Order traversal, In-Order traversal, post-order traversal. <b>Graph</b> - Basic Concept of Graph Theory and its Properties, Representation of Graphs.</p>				
<b>Module 4</b>	<b>Searching &amp; Sorting Performance Analysis</b>	Assignment	Program activity	<b>68 6 Sessions</b>
<p><b>Topic: Sorting &amp; Searching</b> - Sequential and Binary Search, Sorting – Selection and Insertion sort.</p> <p><b>Performance Analysis</b> - Time and space analysis of algorithms – Average, best and worst case analysis.</p>				
<p><b>List of Laboratory Tasks:</b></p> <p><b>Lab sheet -1</b></p> <p><b>Level 1:</b> Program to Create, display, insert, and delete for elements in an array.</p> <p><b>Level 2:</b> Program to merge two sorted arrays into a single sorted array.</p> <p><b>Lab sheet -2</b></p> <p><b>Level 1:</b> Program to demonstrate the working of stack using array.</p> <p><b>Level 2:</b> Program for Towers of Hanoi problem.</p> <p><b>Lab sheet -3</b></p> <p><b>Level 1:</b> Program to convert infix arithmetic expression to post fix expression.</p> <p><b>Level 2:</b> Program to simulate the working of an ordinary queue using an array.</p> <p><b>Lab sheet -4</b></p> <p><b>Level 1:</b> Program to simulate the working of Circular Queue using an array.</p> <p><b>Level 2:</b> Program to Insert and delete a node in a Singly Linked List</p> <p><b>Lab sheet -5</b></p> <p><b>Level 1:</b> Program to find the GCD of two numbers using recursion.</p> <p><b>Level 2:</b> Program to find the Factorial of a Number using recursion</p> <p><b>Lab sheet -6</b></p> <p><b>Level 1:</b> Program to calculate the sum of the first N natural numbers using recursion.</p> <p><b>Level 2:</b> Program to create and display a general Tree without traversal operations.</p> <p><b>Lab sheet -7</b></p> <p><b>Level 1:</b> program to perform basic Operations on binary tree</p> <ul style="list-style-type: none"> <li>a) Create a binary tree</li> <li>b) Insertion</li> <li>c) Deletion</li> </ul> <p><b>Level 2:</b> Program to perform In-order traversal operation.</p>				



### Lab sheet -8

**Level 1:** Program to perform Pre-order traversal operation.

**Level 2:** Program to perform post-order traversal operation.

### Lab sheet -9

**Level 1:** program to search an element using linear search.

### Lab sheet -10

**Level 1:** program to search an element using Binary search.

### Lab sheet -11

**Level 2:** Program to Sort the elements using Bubble sort technique.

### Lab sheet -12

**Level 1:** Program to sort the elements using Insertion Sort.

### Lab sheet -13

**Level 1:** Program to sort the elements using Selection Sort.

### Targeted Application & Tools that can be used

Use of PowerPoint software for lecture slides and use of Ubuntu for lab programs to execute. Tool is Codetantra tool.

### Project work/Assignment:

**Assignment:** Students should complete the lab programs by end of each practical session and module wise assignments before the deadline.

### Text Book

**T1** NarasimhaKarumanchi: *“Data Structures and Algorithms Made Easy in Java”*, 5th Edition, CareerMonk Publications, 2017.

### References

**R1** Mark Allen Weiss: *“Data Structures and Algorithm Analysis in Java”*, 4th Edition, Pearson Educational Limited, 2014.

**R2** Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: *“Data Structures and Algorithms in Java”*, 6th Edition, John Wiley & Sons, Inc., ISBN: 978-1-118-77133-4, 2014.

**R3** Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 2017: *“Introduction to Algorithms”*, 3rd Edition, PHI Learning Private Limited.

### Web resources:

1. For theory: [https://onlinecourses.nptel.ac.in/noc20\\_cs85/preview](https://onlinecourses.nptel.ac.in/noc20_cs85/preview)
2. For Lab : codetantra tool
3. <https://puniversity.informaticsglobal.com/login>

### Topics relevant to development of “Skill Development”:

Linked list and stacks

**Topics relevant to development of “Environment and sustainability: Queues**

### CSA 2101 : Data Structures and Algorithms

<b>Course Code:</b> CSA 2101	<b>Course Title:</b> Data Structures and Algorithms <b>Type of Course:</b> Theory	<b>L- T-P- C</b>	3	0	0	3
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	Problem Solving Using C					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This course introduces the fundamental concepts of data structures and to emphasize the importance of choosing an appropriate data structure and technique for program development. This course has theory and lab component which emphasizes on understanding the implementation and applications of data structures using Java programming language. With a good knowledge in the fundamental concepts of data structures and practical experience in implementing them, the student can be an effective designer, developer for new software applications.					
<b>Course Objective</b>	The objective of the course is <b>SKILL DEVELOPMENT</b> of student by using <b>EXPERIENTIAL LEARNING</b> techniques					
<b>Course Out Comes</b>	<p><b>On successful completion of the course the students shall be able to:</b></p> <p><b>CO1:</b> Implement program for given problems using fundamentals of data structures. ]Understand]</p> <p><b>CO2:</b>Apply an appropriate linear data structure for a given scenarios. ]Apply[</p> <p><b>CO3:</b>Apply an appropriate non-linear data structure for a given scenarios. ]Apply[</p> <p><b>CO4:</b>Explain the performance analysis of given searching and sorting algorithms.[Apply]</p>					
<b>Course Content:</b>						
<b>Module 1</b>	<b>Introduction to Data Structure and Linear Data Structure – Stacks and Queues</b>	Assignment	Program activity			<b>11 Sessions</b>
<p><b>Introduction</b> – Introduction to Data Structures, Types and concept of Arrays.</p> <p><b>Stack</b> - Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.</p> <p><b>Queues</b> - Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.</p>						
<b>Module 2</b>	<b>Linear Data Structure- Linked List</b>	Assignment	Program activity			<b>11 Sessions</b>
<p><b>Topics: Linked List</b> - Singly Linked List, Operation on linear list using singly linked storage structures, Circular List, Applications of Linked list.</p> <p><b>Recursion</b> - Recursive Definition and Processes, Programming examples.</p>						

<b>Module 3</b>	<b>Non-linear Data Structures - Trees and Graph</b>	Assignment	Program activity	<b>11 Sessions</b>
<p><b>Topics: Trees</b> - Introduction to Trees, Binary tree: Terminology and Properties, Use of Doubly Linked List, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post-Order traversal. <b>Graph</b> - Basic Concept of Graph Theory and its Properties, Representation of Graphs.</p>				
<b>Module 4</b>	<b>Searching &amp; Sorting Performance Analysis</b>	Assignment	Program activity	<b>12 sessions</b>
<p><b>Topic: Sorting &amp; Searching</b> - Sequential and Binary Search, Sorting – Selection and Insertion sort.</p> <p><b>Performance Analysis</b> - Time and space analysis of algorithms – Average, best and worst case analysis.</p>				
<p><b>Assignment:</b> Students should complete the lab programs associated with each module by end of each practical session and module wise assignments before the deadline.</p>				
<p><b>Text Book</b></p> <p><b>T1</b> NarasimhaKarumanchi: <i>“Data Structures and Algorithms Made Easy in Java”</i>, 5th Edition, CareerMonk Publications, 2017.</p>				
<p><b>References</b></p> <p><b>R1</b> Mark Allen Weiss: <i>“Data Structures and Algorithm Analysis in Java”</i>, 4th Edition, Pearson Educational Limited, 2014.</p> <p><b>R2</b> Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: <i>“Data Structures and Algorithms in Java”</i>, 6th Edition, John Wiley &amp; Sons, Inc., ISBN: 978-1-118-77133-4, 2014.</p> <p><b>R3</b> Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 2017: <i>“Introduction to Algorithms”</i>, 3rd Edition, PHI Learning Private Limited.</p> <p><b>Web resources:</b></p> <p>4. For theory: <a href="https://onlinecourses.nptel.ac.in/noc20_cs85/preview">https://onlinecourses.nptel.ac.in/noc20_cs85/preview</a></p> <p>5. <a href="https://www.geeksforgeeks.org/data-structures/">https://www.geeksforgeeks.org/data-structures/</a></p>				
<p><b>Topics relevant to development of “Skill Development”:</b></p> <p>Linked list and stacks</p> <p><b>Topics relevant to development of “Environment and sustainability: Queues</b></p>				

## CSA2004 Computer Networks

Course Code: CSA2004	Course Title: Computer Networks Type of Course: Program Core –Theory	L-T-P-C C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course gives a thorough introduction to all the layers of computer network following the top down approach. Application, Transport, Network, and Data link layer protocols are taught with analysis wherever applicable. All important concepts required to take up advanced courses and to face placement tests by an undergraduate student will be covered in this course. This course can be followed up with an advanced computer networks by the student to get a complete understanding of this domain.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Computer Networks and attain Skill Development through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] List the Basic Concepts of Computer Networks and Transport-Layer Services. (Remember) 2] Apply the Knowledge of IP Addressing and Routing Mechanism in Computer Networks. (Apply) 3] Develop the functionalities of Data Link Layer. (Apply) 4] Relate the working principles of wireless devices and security aspects of Networks. (Remember)					
Course Content						
Module 1	Overview, Application, and Transport Layer	Assignment	Problem Solving	12 Classes		
Introduction: Computer Networks, Topologies, OSI Reference Model, Functions of Each Layer, TCP/IP model. Principles of Network Applications, The Web and HTTP, DNS—The Internet’s Directory Service, Socket Programming: Creating Network Applications						
Introduction and Transport-Layer Services, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.						
Module 2	Network Layer	Assignment	Problem Solving	12 Classes		
Overview of Network Layer, Forwarding and Routing, The Data and Control Planes						
The Internet Protocol (IP): IPv4 Addressing, IPv4 Datagram Format, Network Address Translation (NAT), IPv6 Introduction Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Intra-AS Routing in the Internet, OSPF Routing Among the ISPs: BGP, Introduction to BGP. ICMP: The Internet Control Message Protocol						
Module 3	Data Link Layer	Assignment	Problem Solving	08 Classes		

Introduction to the Link Layer, The Services Provided by the Link Layer, Error-Detection and -Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), *MAC Sub Layer, Frame Format, Frame Types*;

Switched Local Area Networks, Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Virtual Local Area Networks (VLANs)

Module 4	Wireless and Security in Computer Networks	Assignment	Problem Solving	08 Classes
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Introduction, Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs, Cellular Networks: 4G and 5G.

Security in Computer Networks: Principles of Cryptography, End-Point Authentication, Securing E-Mail, Operational Security: Firewalls and Intrusion Detection Systems.

**Targeted Application & Tools that can be used:** Cisco Packet Tracer, Wireshark

**Case Study/Assignment:** Assignment proposed for this course in CO1-CO4

Assume that a computer sends a frame at the transport layer to another computer and the destination port address is not running. According to what you read from chapter 2, what will happen to that process?

Determine the possible bit rate and the number of levels over a channel for these cases? a.  $B = 2.4\text{K Hz}$ , noiseless channel with  $L = 16$ . b.  $B = 2.4\text{K Hz}$ ,  $\text{SNR} = 20\text{ dB}$ . c.  $B = 3.0\text{K Hz}$ ,  $\text{SNR} = 40\text{ db}$ .

Using CISCO Packet Tracer Configuring Static and Default Routes  
Objectives

- Configure static routes on each router to allow communication between all clients.
- Test connectivity to ensure that each device can fully communicate with all other devices.

Getting familiar with Wireshark software by installing it I your system, and perform following task:

List out the packets which are having DNS protocols

List of IP address present in the cache along with its MAC addresses

Display all the packets which are having the DNS or HTTP protocol

Problem Solving: Choose and appropriate devices and implement various network concepts.

#### Text Book

James F. Kurose, Keith W. Ross, “*Computer Networking A Topdown Approach*”, 8<sup>th</sup> Edition, Pearson, 2023.

Computer Networks ,Tanenbaum , 5<sup>th</sup> Edition , Pearson Education Media, 2023

Behrouz A. Forouzan, “*Data Communications and Networking*”, 5<sup>th</sup> Edition, Tata McGraw-Hill, 2017

#### References

R1: CompTIA Network+ Certification All in one Exam Guide , Mike Meyers , 7<sup>th</sup> Edition , McGraw Hill, 2023

R2: Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.

Web Based Resources and E-books:

W1: Computer Networks:[https://gaia.cs.umass.edu/kurose\\_ross/index.php](https://gaia.cs.umass.edu/kurose_ross/index.php)

W2:<https://www.coursera.org/learn/computer-networking>

W3: Presidency University -E Library (Knimbus)

[https://presuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=grid&sortFieldId=none&topresult=false&content=\\*cloud\\*](https://presuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=grid&sortFieldId=none&topresult=false&content=*cloud*)

#### Topics relevant to “SKILL DEVELOPMENT”:

Application Layer, Transport Layer, Network Layer for **Skill development** through Participative **Learning** techniques. This is attained through the assessment component mentioned in the course handout.

## CSA2002      Computer Organization

Course Code: CSA2002	Course Title: Computer Organization	L-T-P- C	3	0	0	3
	Type of Course: Program Core and Theory					
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	<p>Computer Organization is an introductory course that focuses on the fundamental principles and concepts behind the design and implementation of modern computer systems. The course explores the structure and functionality of computers at the hardware level, providing students with a solid foundation in understanding how computers work.</p> <p>Throughout the course, students will delve into various topics related to computer organization, including processor architecture, memory systems, input/output (I/O) devices, and system buses. They will gain an understanding of the interplay between hardware and software and how they interact to execute programs and perform computations efficiently.</p>					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Computer Organization and attain Skill Development through Participative Learning techniques.					
Course Out Comes	CO1 : outline basic structure and operations of a computer. [Understand] CO2 : categorize the arithmetic and logic unit and implementation of fixed-point and floating-point arithmetic unit. CO3 : experiment the basics of pipelined execution. CO4 : explain parallelism and multi-core processors.					
Course Content:						
Module 1	COMPUTER ORGANIZATION & INSTRUCTIONS	Assignments	Quizzes form basics of CA	10 Sessions		
Basics of a computer system: Evolution, Ideas, Technology, Performance, Power wall, Uniprocessors to Multiprocessors. Addressing and addressing modes. Instructions: Operations and Operands, Representing instructions, Logical operations, control operations.						
Module 2	ARITHMETIC	Quizzes and assignments	Comprehension based Quizzes and assignments	8 Sessions		
Fixed point Addition, Subtraction, Multiplication and Division. Floating Point arithmetic, High performance arithmetic, Subword parallelism						
Module 3	THE PROCESSOR	Term paper/Assignment	Quizzes form advanced python	8 Sessions		
Introduction, Logic Design Conventions, Building a Datapath — A Simple Implementation scheme — An Overview of Pipelining — Pipelined Datapath and Control. Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions.						
Module 4	MEMORY AND I/O ORGANIZATION	Term paper/Assignment	Classification on Memory Organization	10 Sessions		
Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices.						
Module 5	ADVANCED COMPUTER ARCHITECTURE	Term paper/Assignment	CA	9 Sessions		

Parallel processing architectures and challenges, Hardware multithreading, Multicore and shared memory multiprocessors, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers — Introduction to Multiprocessor network topologies.

**List of Laboratory Tasks:**

Each Lab sheets experiments are prepared by level 0 and level 1 module wise.

**Targeted Application & Tools that can be used:**

NA

**Assignment:**

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

**Text Book**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2021.
2. Godse, A. P., & Godse, D. A. (2021). Computer Organization and Architecture. Technical Publications.

**References**

1. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software interface”, Elsevier, 2019.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.
2. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill.

**Topics relevant to “SKILL DEVELOPMENT”:**

Logic Design Conventions, Parallel Processing Architectures for **Skill development** through Participative **Learning** techniques. This is attained through the assessment component mentioned in the course handout.

**Catalogue prepared by**

Vetrimani Elangovan

**Recommended by the Board of Studies on**

3<sup>rd</sup> BOS held on 17<sup>th</sup> July 2023

**Date of Approval by the Academic Council**

21<sup>st</sup> Academic Council dated on \_\_\_\_\_.

**CSA2103      Relational Database Management Systems**

<b>Course Code:</b> CSA2103	<b>Course Title:</b> Relational Database Management Systems <b>Type of Course:</b> Program Core and Theory			<b>L-T-P-C</b>	3	0	0	3
<b>Version No.</b>	1.0							
<b>Course Pre-requisites</b>	Nil							
<b>Anti-requisites</b>	NIL							
<b>Course Description</b>	This course introduces the core principles and techniques required in the design and implementation of database systems. It covers concepts of relational database systems (RDBMS). More emphasis is set on how to design, develop, organize, maintain and retrieve the information efficiently. It helps the students to learn and practice data modeling and database designs.							
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>Relational Database Management Systems</b> and attain <b>Skill Development</b> through <b>Participative Learning</b> techniques.							
<b>Course Outcomes</b>	On successful completion of the course the students shall be able to: CO1 : Describe a database system using ER model and relational algebra. CO2 : Apply Relational Algebra and Database Querying concepts in designing the database. CO3 : Solve various normalization techniques for designing a robust database.							
<b>Course Content:</b>								
<b>Module 1</b>	<b>Introduction to Database Modelling and Relational Algebra</b>	Assignment	Comprehension based Quizzes and assignments	<b>15 Sessions</b>				
<b>Introduction to Database:</b> Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model. <b>Relational Algebra</b> with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.								
<b>Module 2</b>	<b>Fundamentals of SQL and Query Optimization</b>	Assignment	Programming activity	<b>15 Sessions</b>				
<b>Database Querying:</b> DDL, DML, Constraints, Operators- BETWEEN, IN, LIKE, where clause, order by command, Set Operators, Aggregate Functions, having, group by clauses, Views, Procedures, Cursors and Triggers. <b>Query Optimization:</b> Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.								



<b>Module 3</b>	<b>Designing and Refining Database Schema</b>	Assignment	Quizzes form advancedpython	<b>15 Sessions</b>
<b>Schema Design:</b> Problems in schema design, redundancy and anomalies				
<b>Schema refinement:</b> Functional Dependencies, Normalization and forms - First, Second, Third, Dependency Preservation – Boyce/Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.				
<b>Fundamentals of Transaction:</b> Introduction to Transaction Processing, Transaction and System concepts, Desirable properties (ACID) of Transactions.				
<b>List of Laboratory Tasks:</b> NA				
<b>Targeted Application &amp; Tools that can be used:</b> NA				
<b>Assignment:</b>				
Assignments are given after completion of each module which the student need to submit within the stipulated deadline.				
<b>Text Book</b> <ol style="list-style-type: none"> <li>1. Elmasri R and Navathe S B, “Fundamentals of Database System”, Pearson Publication, 7th Edition, 2018.</li> <li>2. RamaKrishna &amp; Gehrke, “Database Management Systems” 3rd Edition, 2018, McGraw-Hill Education.</li> <li>3. W. Lemahieu, S. vanden Broucke and B. Baesens, “Principles of Database Management: Practical Guide to Storing, Managing and Analyzing Big and Small Data”, Cambridge University Press, 2018.</li> </ol>				
<b>References</b> <ol style="list-style-type: none"> <li>1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, McGraw-Hill ,7th Edition, 2019.</li> <li>2. M. Kleppmann, “Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems”, O’Reilly, 2017.</li> </ol>				
<b>Topics relevant to “SKILL DEVELOPMENT”:</b> Schema Design, Schema Refinement, Transactions for <b>Skill development</b> through <b>Participative Learning</b> techniques. This is attained through the assessment component mentioned in the course handout.				

### CSA2104 Relational Database Management Systems Lab

<b>Course Code:</b> CSA2104	<b>Course Title:</b> Relational Database Management Systems Lab <b>Type of Course:</b> Program Core and Laboratory		<b>L-T-P- C</b>	0	0	2	1
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	CSA2103 – Relational Database Management Systems (Basics of Database)						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	This course is designed to implement various databases using MySQL DATABASE in information technology applications. All the exercises will focus on the fundamentals for creating, populating, sophisticated, interactive way of querying, and simultaneous execution of the transactions of database.						
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>Relational Database Management Systems</b> and attain <b>Skill Development</b> through <b>Experiential Learning</b> techniques.						
<b>Course Outcomes</b>	On successful completion of the course the students shall be able to: CO1 : Describe a database system using ER model and relational algebra. CO2 : Apply Relational Algebra and Database Querying concepts in designing the database.						
<b>Course Content:</b>							
<b>Module 1</b>	<b>Introduction to Database Modelling and Relational Algebra</b>	Assignment	Comprehension based Quizzes and assignments	<b>7 Sessions</b>			
<p><b>Introduction to Database:</b> Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model.</p> <p><b>Relational Algebra</b> with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.</p>							
<b>Module 2</b>	<b>Fundamentals of SQL and Query Optimization</b>	Assignment	Programming activity	<b>8 Sessions</b>			
<p><b>Database Querying:</b> DDL, DML, Constraints, Operators- BETWEEN, IN, LIKE, where clause, order by command, Set Operators, Aggregate Functions, having, group by clauses, Views, Procedures, Cursors and Triggers.</p> <p><b>Query Optimization:</b> Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.</p>							

### **List of Laboratory Tasks:**

**Create Employee, Student, Banking and Library databases and populate them with required data. Do the following experiments of different lab sheets on those databases.**

#### **Labsheet-1 [3 Practical Sessions]**

##### **Experiment No 1:**

**To study and implement the different language of Structured Query Language.**

**Level 1:** Perform operations using Data Definition Language and Data Manipulation Language commands including different variants of SELECT on Student DB.

**Level 2:** Identify the given requirements; valid attributes and data types and Perform DDL and DML operations on a given scenario. [Banking Databases]

##### **Experiment No. 2:**

**To study and implement the concept of integrity constraints in SQL.**

**Level 1:** Create tables on Banking database using PRIMARY KEY, NOT NULL, UNIQUE, FOREIGN KEY and demonstrate the working of relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators on Student Database.

**Level 2:** Enforce different types of data and referential integrity constraints. Then try queries with special operators based on the student database. [Banking Database].

#### **Labsheet-2 [4 Practical Sessions]**

##### **Experiment No. 3:**

**Implement complex queries in SQL.**

**Level 1:** Implement the conjugate of GROUP BY, ORDER BY and aggregate functions on Banking Database. **Level**

**2:** Implement MySQL DB queries on library database using appropriate clauses and aggregate functions. Also order the data either in ascending and descending order using corresponding clause. [Library databases].

##### **Experiment No. 4:**

**To study and implement different types of Set and Join Operations**

**Level 1:** Demonstrate different types of Set Operations (UNION, UNION ALL, INTERSECT, MINUS) and Join Operations (INNER JOINS, OUTER JOINS, CROSS JOIN, NATURAL JOIN) on two or more tables of Airline Database. **Level 2:** Use Set and Join operations to retrieve the data from two or more relations (tables) as per the given

scenario. [Airline Database]

#### **Labsheet-3 [3 Practical Sessions]**

##### **Experiment No. 5:**

**To study and implement Views, and Procedures in MySQL DB.**

**Level 1:** Implement MySQL Views, and Procedures in ORACLE DB on Employee database.

**Level 2:** Analyze the requirement and construct views, and Procedures on Mini Project Domain. [Banking Database]

#### **Labsheet-4 [2 Practical Sessions]**

##### **Experiment No. 6:**

**To study and implement Functions, and Triggers in MySQL DB.**

**Level 1:** Implement Oracle Functions and Triggers in Oracle on Employee database.

**Level 2:** Analyze the requirement and construct Functions and Triggers. [Supply chain Database]

#### **Labsheet-5 [2 Practical Sessions]**

##### **Experiment No. 7:**

**To implement the concept of forms and reports.**

**Level 1:** Implement the concept of forms and reports.

**Level 2:** Analyze the schema relationship.

#### **Labsheet-6 [3 Practical Sessions]**

##### **Experiment No. 8:**

**Design a mini project based on the databases such as Inventory Management System, University Management System, Hospital Management System, etc.**

**Level 1:** Implement the real time database.

**Level 2:** Analyze the working of database in real time.

**Targeted Application & Tools that can be used:**

Application Area: Relational database systems for Business, Scientific and Engineering Applications.  
Tools/Simulator used: MySQL Database for student practice.

**Assignment:**

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

**Text Book**

4. Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Publication, 7th Edition, 2018.
5. RamaKrishna & Gehrke, "Database Management Systems" 3rd Edition, 2018, McGraw-Hill Education.
6. W. Lemahieu, S. vanden Broucke and B. Baesens, "Principles of Database Management: Practical Guide to Storing, Managing and Analyzing Big and Small Data", Cambridge University Press, 2018.

**References**

3. Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill ,7th Edition, 2019.
4. M. Kleppmann, "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems", O'Reilly, 2017.

**Topics relevant to "SKILL DEVELOPMENT":**

Relational database design using ER- Relational mapping, Implementation of given database scenario using MySQL Database for **Skill development** through **Experiential Learning** techniques. This is attained through the assessment component mentioned in the course handout.

**CSA2020      Artificial Intelligence**

<b>Course Code:</b> CSA2020	<b>Course Title:</b> Principles of Artificial Intelligence Type of Course: Theory Only Course	L- T- P- C	3	0	0	3
Version No.	1					
Course Pre-requisites	Mathematics: Logic, Algebra, Probability					
Anti-requisites						
Course Description	<p>This Course will introduce the basic principles in artificial intelligence. It will cover representation schemes, problem solving paradigms, search strategies, knowledge representation and Probabilistic Reasoning.</p> <p>Topics include: AI methodology and fundamentals, intelligent agents, search algorithms, game playing, supervised and unsupervised learning, uncertainty and probability theory, probabilistic reasoning in AI and Bayesian networks</p>					
Course Objective	: This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.					
Course Out Comes	<p>On successful completion of the course the students shall be able to:</p> <p>CO1: Explain the basic concepts of Artificial Intelligence and application of AI in several domains such as business and governance domains. [Comprehension]</p> <p>CO2: Demonstrate knowledge of reasoning and knowledge representation for solving real world problems[Application]</p> <p>CO3: Analyze and illustrate how informed and uninformed search algorithms play vital role in problem solving. [Application]</p> <p>CO4: Explain learning probabilistic reasoning in AI. [Comprehension]</p> <p>CO5: Explain simple and complex decision making in AI. [Comprehension]</p>					
Course Content:						
Module 1	Introduction to Artificial Intelligence	Assignment	Data Collection/Interpretation	6Sessions		
Topics: Introduction to Artificial Intelligence, Definitions, foundation, History and Applications; Agents: Types of Agents, Structure of Intelligent agent and its functions, Agents and Environment. Case Studies: Agricultural Domain, Business and Marketing, Automatic Car Parking System.						
Module 2	Logic based Knowledge Representation and Reasoning	Case studies / Case let	Case studies	7 Sessions		
Topics: Introduction to Knowledge representation, Knowledge-based Agents, Knowledge-Based Systems; Frame Structures, Propositional Logic, First order Logic, Inference in First Order Logic (FOL), Introduction to Reasoning, types of reasoning						

Module 3	Problem Solving by searching	Quiz	Case studies	9 Sessions
Topics: Problem space and search, State space search techniques solving problems by searching: Classical Search, Adversarial Search, and Constraint Satisfaction Problem, Adversarial Search Methods.				
Module 4	Learning and Probabilistic reasoning in AI	Quiz	Case studies	8 Sessions
Topics: Introduction to learning, Learning Concepts, Methods and Models: Supervised Learning, Unsupervised Learning, Reinforcement Learning, ANN-based Learning, Probabilistic reasoning in AI, Bayesian networks				
Module 5	Decision Making	Quiz	Case studies	8 Sessions
Topics: Making Simple Decisions: Beliefs and Desires under Uncertainty, Utility Theory, Making Complex Decisions: Sequential Decision Problems, Multiagent Decision Making				
Assignment: Assignment-1 (Report) Assignment-2 (Quiz) Group Seminar				
Text Book T1. Stuart J. Russell and Peter Norvig, “ <i>Artificial intelligence: A Modern Approach</i> ”, 4 <sup>th</sup> edition, Upper Saddle River, Prentice Hall, 2020.				
References R1. David L. Poole and Alan K. Mackworth, “ <i>Artificial Intelligence: Foundations of Computational Agents</i> ”, 2nd edition, Cambridge University Press, 2020 R2. John Paul Mueller, Luca Massaron, “ <i>Artificial Intelligence for dummies</i> ”, 2 <sup>nd</sup> edition, Wiley, 2021. R3. Daeyeol Lee, “ <i>Birth of Intelligence: From RNA to Artificial Intelligence</i> ”, 1 <sup>st</sup> edition, Oxford University Press, 2020.  E book link R1: <a href="https://www.researchgate.net/file.PostFileLoader.html?id=5440e3bdd5a3f298288b45fe&amp;assetKey=AS%3A273625985290242%401442248926315">https://www.researchgate.net/file.PostFileLoader.html?id=5440e3bdd5a3f298288b45fe&amp;assetKey=AS%3A273625985290242%401442248926315</a>  E book link R2: <a href="https://www.wiley.com/en-us/Artificial+Intelligence+For+Dummies,+2nd+Edition-p-9781119796763">https://www.wiley.com/en-us/Artificial+Intelligence+For+Dummies,+2nd+Edition-p-9781119796763</a>				
Topics relevant to development of “Skill Development”: Knowledge-based Agents, Knowledge-Based Systems; Frame Structures, Propositional Logic, First order Logic, Inference in First Order Logic (FOL). Methods and Models: Supervised Learning, Unsupervised Learning, Reinforcement Learning, ANN-based Learning, Probabilistic reasoning in AI, Bayesian networks Topics relevant to development of “Environment and sustainability:NA				

**CSA2005      Analysis of Algorithms**

Course Code: CSA 2005	Course Title: Analysis of Algorithms			L- T-P- C	3	0	0	3
	Type of Course: THEORY Only							
Version No.	2.0							
Course Pre-requisites	Introduction to Pseudo code, Knowledge of Recursive and Non Recursive algorithms, Meaning of correctness.							
Anti-requisites								
Course Description	This Course introduces techniques for the design and analysis of efficient algorithms and methods of applications. Deals with analyzing time and space complexity of algorithms, and to evaluate trade-offs between different algorithms.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Analysis of Algorithms and attain Skill Development through Problem Solving Methodologies.							
Course Out Comes	On successful completion of the course the students shall be able to: 1. Classify the types of asymptotic notations. 2. Discuss the Brute Force Technique used for solving a problem. 3. Explain divide and conquer technique for searching and sorting problems. 4. Discuss the Dynamic Programming Algorithm used for solving a problem. 5. Discuss the Back tracking technique and limitations of Algorithms.							
Course Content:								
Module 1	Introduction	Assignment	Simulation/Data Analysis	08 Sessions				
Important Problem types, Asymptotic Notations and its properties, Mathematical analysis for Recursive and Non-recursive algorithms.								
Module 2	Algorithm design techniques-Brute force	Assignment	Numerical from E-Resources	09 Sessions				
Selection Sort, sequential search, Uniqueness of Array, Exhaustive search Travelling Salesman, Knapsack Problem.								
Module 3	Divide-and-conquer	Term paper/Assignment	Simulation/Data Analysis	08 Sessions				
Master Theorem, Merge sort, Quick sort, Binary search.								
Module 4	Dynamic programming and greedy technique	Term paper/Assignment	Simulation/Data Analysis	08 Sessions				
Introduction, Coin changing problem, Multi stage graph – Optimal Binary Search Trees, warshall's, floyds, 0/1 Knapsack, Prim's, Kruskal's, Dijkstra's Algorithm.								
Module 5	Complexity Classes	Term paper/Assignment	Simulation/Data Analysis	06 Sessions				
Complexity Classes- P,NP- NP Hard and NP Complete - Boolean Satisfiability Problem (SAT). Hamiltonian Path Problem, M Coloring Problem. Backtracking, - Backtracking – n-Queens problem.								
<b>Text Book</b> Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, PHI Learning Private Limited.								
<b>References</b> 1. AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education. 2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson. 3. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1 and 3 Pearson. <b>E-Resources</b> NPTEL course – <a href="https://onlinecourses.nptel.ac.in/noc19_cs47/preview">https://onlinecourses.nptel.ac.in/noc19_cs47/preview</a> <a href="https://www.coursera.org/learn/analysis-of-algorithms">https://www.coursera.org/learn/analysis-of-algorithms</a> <a href="https://puuniversity.informaticsglobal.com">https://puuniversity.informaticsglobal.com</a>								
<b>Topics relevant to “SKILL DEVELOPMENT”</b> : knapsack, prims, kruskals algorithm, quick sort, binary search for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.								

**CSAXXXX    Operating Systems and Unix Programming**

<b>Course Code:</b> CSA XXXX	<b>Course Title:</b> <b>OPERATING SYSTEM AND UNIX PROGRAMMING</b>		<b>L-T-P- C</b>	2	0	0	2
	<b>Type of Course: Core Theory</b>						
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	The prerequisites for this course are Data Structures and Computer Organization. You are expected to have a working knowledge of C / C++, including a familiarity with its basic data types and control structures, and an understanding of computer organization.						
<b>Anti-requisites</b>	Nil						
<b>Course Description</b>	The main objective of this course is to cover basic concepts of operating systems. Operating Systems functions, Basic Concepts, Notion of a process, Concurrent processes, Problem of mutual exclusion, Deadlock, Process Scheduling, Memory management, Multiprogramming, File systems; time sharing systems and their design consideration. This course will prepare students to develop software in and for Linux/UNIX environments. Also this course helps the students in UNIX operating system and their effective use for problem solving.						
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of <b>Operating Systems and Unix Programming</b> and attain <b>Skill Development</b> through <b>Experiential Learning</b> techniques.						
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li><b>Describe</b> the various OS Types, Services, structures and layers, system calls related to OS management and interpreting different stages of various process states.</li> <li><b>Describe</b> the IPC and Deadlocks with methodologies and explore the communication between inter process and synchronization techniques and Implement memory placement strategies, replacement algorithms related to main memory and virtual memory techniques.</li> <li><b>Understand</b> the Memory Management and Allocation concepts</li> <li><b>Design</b> Virtual Memory and File Management with CPU scheduling algorithms to meet and validate the scheduling criteria and the file systems; file allocation, access techniques along with virtualization concepts and designing of OS with protection and security enabled capabilities</li> </ol>						
<b>Course Content:</b>							
<b>Module 1</b>	<b>Introduction to OS and System Structure</b>	Assignment					<b>8 Sessions</b>
Topics: <b>Introduction:</b> Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS. <b>Processes:</b> Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Process Scheduling: Scheduling algorithms:, Multiprocessor scheduling: Real Time scheduling:							
<b>Module 2</b>	<b>IPC and Deadlocks</b>	Assignment					<b>7 Sessions</b>
Topics: Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Deadlocks - prevention, avoidance, detection and recovery. Thread: Definition, Various							



states, Benefits of threads, Types of threads, Concept of multithreads. Banker's algorithm, Deadlock detection and Recovery				
<b>Module 3</b>	<b>Memory Management</b>	Case Study		<b>8 Sessions</b>
<p>Topics:</p> <p><b>Memory Management:</b> Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction.</p>				
<b>Module 4</b>	<b>Virtual Memory and File Management</b>	Case Study and Project		<b>7 Sessions</b>
<p>Topics:</p> <p><b>Virtual Memory:</b> Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)</p> <p><b>File Management:</b> Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods , Free-space management , directory implementation , efficiency and performance</p>				
<b>Targeted Application &amp; Tools that can be used: Linux / Vi Editor</b>				
<b>Project work/Assignment:</b>				
Assignments are given after completion of each module which the student need to submit within the stipulated deadline.				
<b>Text Books</b>				
<ol style="list-style-type: none"> <li>1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne-Operating System Concepts, Wiley, 10th Edition, 2019.</li> <li>2. Tanenbaum, Andrew S., and Albert S. Woodhull. Operating systems: design and implementation. Vol. 68. Englewood Cliffs: Prentice Hall, 1997</li> </ol>				
<b>Reference Books</b>				
<ol style="list-style-type: none"> <li>1. The Unix programming Environment by Brian W. Kernighan &amp; Rob Pike, Pearson.</li> <li>2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson</li> <li>3. Unix and shell programming by B.M. Harwani, OXFORD university press.</li> <li>4. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci-Dusseau Books, Inc, 2015</li> <li>5. Dhamdhere, Dhananjay M. Operating systems: a concept-based approach, 2E. Tata McGraw-Hill Education, 2006.</li> <li>6. Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes. Operating systems. Delhi. Pearson Education: Dorling Kindersley, 2004.</li> <li>7. Milenkovič, Milan. Operating systems: concepts and design. McGraw-Hill, Inc., 1987.</li> </ol>				
<b>Web References</b>				
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a></li> <li>2. <a href="https://nptel.ac.in/courses/106106144">https://nptel.ac.in/courses/106106144</a></li> <li>3. <a href="https://nptel.ac.in/courses/117106113">https://nptel.ac.in/courses/117106113</a></li> <li>4. <a href="https://www.udemy.com/course/unix-getting-started/">https://www.udemy.com/course/unix-getting-started/</a></li> <li>5. <a href="https://www.coursera.org/learn/unix">https://www.coursera.org/learn/unix</a></li> </ol>				
<b>Topics relevant to “Skill Development”:</b> Interrupt Handling and System calls, Deadlock detection, fragmentation, scheduling algorithms for <b>Skill Development through Experiential Learning Techniques</b> . This is attained through assessment component mentioned in course handout.				

**CSAXXXX    Operating Systems and Unix Programming Lab**

<b>Course Code:</b> CSA 1007	<b>Course Title: OPERATING SYSTEM AND UNIX PROGRAMMING</b>			<b>L- T- P- C</b>	0	0	2	1
	<b>Type of Course: Lab</b>							
<b>Version No.</b>	1.0							
<b>Course Pre-requisites</b>	The prerequisites for this course are Data Structures and Computer Organization. You are expected to have a working knowledge of C / C++, including a familiarity with its basic data types and control structures, and an understanding of computer organization.							
<b>Anti-requisites</b>	Nil							
<b>Course Description</b>	The main objective of this course is to cover basic concepts of operating systems. Operating Systems functions, Basic Concepts, Notion of a process, Concurrent processes, Problem of mutual exclusion, Deadlock, Process Scheduling, Memory management, Multiprogramming, File systems; time sharing systems and their design consideration. This course will prepare students to develop software in and for Linux/UNIX environments. Also this course helps the students in UNIX operating system and their effective use for problem solving.							
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of <b>Operating Systems and Unix Programming</b> and attain <b>Skill Development</b> through <b>Experiential Learning</b> techniques.							
<b>Course Outcomes</b>	<p>5. <b>Describe</b> the various OS Types, Services, structures and layers, system calls related to OS management and interpreting different stages of various process states.</p> <p>6. <b>Describe</b> the IPC and Deadlocks with methodologies and explore the communication between inter process and synchronization techniques and Implement memory placement strategies, replacement algorithms related to main memory and virtual memory techniques.</p> <p>7. <b>Understand</b> the Memory Management and Allocation concepts</p> <p>8. <b>Design</b> Virtual Memory and File Management with CPU scheduling algorithms to meet and validate the scheduling criteria and the file systems; file allocation, access techniques along with virtualization concepts and designing of OS with protection and security enabled capabilities</p>							
<b>Course Content:</b>								
<b>Module 1</b>	<b>Introduction to OS and System Structure</b>	Assignment						<b>8 Sessions</b>
Topics: <b>Introduction:</b> Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS. <b>Processes:</b> Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. <b>Process Scheduling:</b> Scheduling algorithms:, Multiprocessor scheduling: Real Time scheduling:								
<b>Module 2</b>	<b>IPC and Deadlocks</b>	Assignment						<b>7 Sessions</b>

Topics:

Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Deadlocks - prevention, avoidance, detection and recovery. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads. Banker's algorithm, Deadlock detection and Recovery

**Module 3**

**Memory Management**

Case Study

**8 Sessions**

Topics:

**Memory Management:** Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction.

**Module 4**

**Virtual Memory and File Management**

Case Study and Project

**7 Sessions**

Topics:

**Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods , Free-space management , directory implementation , efficiency and performance

**Targeted Application & Tools that can be used:**

**Linux / Vi Editor**

**Project work/Assignment:**

**Assignment:**

**Lab Experiments**

**Experiment 1**

**Level 1 :** To study of Basic UNIX Commands and various UNIX editors such as vi

**Level 2 :** To study the File manipulation Commands

**Experiment 2**

**Level 1 :** Programs using the following system calls of UNIX operating system fork, exec, getpid, exit,wait

**Level 2 :** Programs using the following system calls of UNIX operating system close, stat, opendir, readdir

**Experiment 3**

**Level 1 :** PROGRAM FOR SIMULATION OF LS UNIX COMMANDS

**Level 2 :** PROGRAM FOR SIMULATION OF GREP UNIX COMMANDS

**Experiment 4**

**Level 1 :** Write a Shell program to check the given number is even or odd

**Level 2 :** Write a Shell program to check the given year is leap year or not

**Experiment 5**

**Level 1 :** Write a Shell program to find the factorial of a number

**Level 2 :** Write a Shell program to swap the two integers

**Experiment 6**

**Level 1 :** Implementation of Priority scheduling algorithms. With total and average waiting time

**Level 2 :** Implementation of Priority scheduling algorithms. With total and average turnaround time

**Experiment 7**

- Level 1 : Write a Shell program to display a given Message
- Level 2 : Write a Shell Program to find the roots of the quadratic equation.

#### Experiment 8

- Level 1 : Write a shell program to find the smallest digit of a value
- Level 2 : Write a shell script to perform integer arithmetic operations

#### Experiment 9

- Level 1 : Write a shell program to reverse a number.
- Level 2 : Write a shell program to find the sum of even and odd numbers in an array

#### Experiment 10

- Level 1 : Write a Simple Shell script to print the sum of n natural numbers
- Level 2 : Write a shell program to count the number of digits of a value.

1. Study of Linux commands – System Information, Files and Directories, Process, Text Processing and Scripting, Programming.
2. Creating Child process (using fork), Zombie, Orphan. Displaying system information using C.
3. Shell scripting (I/O, decision making, looping)
4. IPC (Threads, Pipes)
5. CPU Scheduling Algorithms (FCFS, SJF, RR, Priority)
6. Deadlock Avoidance Algorithm (Bankers algorithm)
7. Process synchronization (Producer Consumer / Reader Writer/Dining Philosopher using semaphores)
8. Page Replacement Algorithms. (FIFO, LRU, Optimal)
9. Dynamic Memory Allocation Algorithms (First fit, Best fit, Worst fit)
10. Disk Scheduling Algorithms

#### Text Books

3. Abraham Silberschatz, Peter B. Galvin, Greg Gagne-Operating System Concepts, Wiley, 10th Edition, 2019.
4. Tanenbaum, Andrew S., and Albert S. Woodhull. Operating systems: design and implementation. Vol. 68. Englewood Cliffs: Prentice Hall, 1997

#### Reference Books

8. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
9. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson
10. Unix and shell programming by B.M. Harwani, OXFORD university press.
11. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci-Dusseau Books, Inc, 2015
12. Dhamdhare, Dhananjay M. Operating systems: a concept-based approach, 2E. Tata McGraw-Hill Education, 2006.
13. Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes. Operating systems. Delhi. Pearson Education: Dorling Kindersley, 2004.
14. Milenkovič, Milan. Operating systems: concepts and design. McGraw-Hill, Inc., 1987.

#### Web References

6. <https://nptel.ac.in/courses/106108101>
7. <https://nptel.ac.in/courses/106106144>
8. <https://nptel.ac.in/courses/117106113>
9. <https://www.udemy.com/course/unix-getting-started/>
10. <https://www.coursera.org/learn/unix>

**Topics relevant to “Skill Development”:** Interrupt Handling and System calls, Deadlock detection, fragmentation, scheduling algorithms for **Skill Development through Experiential Learning Techniques**. This is attained through assessment component mentioned in course handout.

**CSA2006      Fundamentals of Software Engineering**

<b>Course Code:</b> CSA2006	<b>Course Title:</b> Fundamentals of Software Engineering <b>Type of Course:</b> Program Core - Theory	<b>L- T- P- C</b>	3	0	0	3
<b>Version No.</b>	2.0					
<b>Course Pre-requisites</b>	NIL					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This course aims to equip students with a comprehensive understanding of the software development process and software project management principles. It covers key aspects such as software process models, requirement engineering, system analysis, design, implementation, and testing. Additionally, students will explore project evaluation, planning, effort estimation, and risk management, essential for effective software project execution. Through this course, students will gain the skills necessary to develop reliable software systems while managing project constraints effectively.					
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Software Engineering and attain Skill Development through Participative Learning techniques.					
<b>Course Outcomes</b>	On successful completion of this course the students shall be able to: Understand the software engineering principles, ethics and process models. [Knowledge] Identify the requirements and appropriate design models for a given application. [Comprehension] Discuss the various types of testing methods and Quality Assurance. [Comprehension] Apply project planning, scheduling, evaluation and risk management principles for a given project. [Application]					
<b>Course Content:</b>						
<b>Module 1</b>	Introduction to Software Engineering & Process Models	Assignment	Agile Development	11 Sessions		
Topics: Software and Software Engineering: Nature of Software, Software Engineering Practice, Software Myths, SDLC and Software Processes: Generic Model, Prescriptive Process Model, Unified Process Model, Agile Development: Extreme Programming, SCRUM.						
<b>Module 2</b>	Software Requirements and Design	Assignment	Functional and non-Functional requirements	10 Sessions		
Topics: Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements, SRS, Requirements modeling: Developing Use Cases, Developing Activity diagram and Swim lane diagram, Design: Design concepts, Architectural design, Component based design, User interface design.						
<b>Module 3</b>	Software Testing And Quality	Assignment	SCM process	11 Sessions		
Topics: Introduction to Software Testing: verification and validation, Test Strategies for conventional Software, Validation Testing, Whitebox Testing: Basis path testing, Blackbox Testing. Software Quality Assurance: Elements of software quality assurance, SQA Tasks, Goals and Metrics, Software configuration management :SCM process.						
<b>Module 4</b>	Software Project Management	Case Study	Estimation of Software Projects	13 Sessions		
Topics: Project Management Concepts, Project Planning, Overview of metrics, Estimation for Software projects, Project Scheduling, Risk Management, Maintenance and Reengineering, Software Process Improvement (SPI): CMM Levels.						
<b>Targeted Application &amp; Tools that can be used:</b> MatLab, Python, Netbeans and AWS etc.,						

**Project work/Assignment:**

Assignment 1: Testing sample application using Black box and White box approaches and understand the differences in selecting of test cases from the test suite.

Assignment 2: Preparation of Software Configuration Management template for a software project. •

Calculation of Test metrics for Sample application.

Project 1: Designing UI of Sample application

**Textbooks:**

T1: Roger S. Pressman, “*Software Engineering: A Practitioner’s Approach*”, *Seventh Edition*, McGraw Hill International edition, 2009.

T2. BobHughes, MikeCotterell, RajibMall, “*Software ProjectManagement*”, *VI Edition*, McGraw-Hill, 2018.

**References:**

R1 : Ian Sommerville, “*Software Engineering, Ninth Edition*”, Pearson Education, 2008.

R2 : Watts S.Humphrey, “*A Discipline for Software Engineering*”, Pearson Education, 2007.

R3. RajibMall, “*Fundamentals of Software Engineering*”, *VI Edition*, PHI learning private limited, 2014.

**Web references:**

<https://www.studocu.com/row/document/lead-city-university/software-engineering/software-engineering-lecture-note/10888094>

[https://www.youtube.com/watch?v=WxkP5KR\\_Emk](https://www.youtube.com/watch?v=WxkP5KR_Emk)

<https://www.youtube.com/watch?v=OVZYOItkUUs>

<https://unimelb.libguides.com/c.php?g=931690&p=6734359>

<https://presiuniv.knimbus.com/user#/home>

<https://nptel.ac.in/courses/>

**Topics relevant to “SKILL DEVELOPMENT”:**

Software engineering, Requirement engineering, Software testing, Project Management for **Skill development** through Experiential **Learning** techniques. This is attained through the assessment component mentioned in the course handout.

**CSA2010      Software Testing**

Course Code: CSA2010	Course Title: Software Testing Type of Course: Program Core & Theory and Laboratory Integrated	L-T- P-C	2	0	2	3
Version No.	1.0					
Course Pre-requisites	Software Engineering					
Anti-requisites	NIL					
Course Description	This course will examine fundamental software testing and related program analysis techniques. In particular, the important phases of testing will be reviewed, emphasizing the significance of each phase when testing different types of software. The course will also include concepts such as test generation, test oracles, test coverage, regression testing, mutation testing, program analysis (e.g., program-flow and data-flow analysis), and test prioritization.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of <b>Software Testing</b> and attain Employability through Experiential learning.					
Course Out Comes	On successful completion of the course the students shall be able to: Describe the fundamentals of software testing for Quality assurance. [Comprehension] Develop Test cases to test Applications / Software's. [Comprehension] Write Bug reports found in Testing Applications / Software's. [Application]					
Course Content:						
Module 1	Fundamentals of Software Testing	Quiz	Data Collection	20 Sessions		
Phases of Software Project – Quality assurance and Quality Control – Software Development Life Cycle (SDLC) Models – Software Testing and Its Types Software Testing Life Cycle (STLC).						
Module 2	Test Case Development and Execution	Case Study	Programming Task	20 Sessions		
Test Cases – Identification of Test case Scenarios – Test Case Template – Writing Test cases for Problems – Test Case Execution and Examples for Lab Exercises.						
Module 3	Bug Reporting and Automation Testing	Assignment	Programming Task	20 Sessions		
Defect Life Cycle, Bug Reporting – Template and Examples for Lab Exercises – Basics of Software Test Automation – Software Testing Metrics.						
List of Experiments: These experiments can be done using C++ Programming Lab Experiments are to be conducted on the following topics						
Lab exercises on Black Box Testing Triangle problem: Boundary Value Testing (BVT) and Decision Table Testing (DTT) Commission problem Boundary Value Testing (BVT) and Decision Table Testing (DTT) Next-Date display problem: Boundary Value Testing (BVT) and Decision Table Testing (DTT)						
Lab exercises on White Box Testing Binary Search algorithm: control low graph, Cyclometric Complexity, Basis Path testing Absolute Grading Procedure: control low graph, Cyclometric Complexity, Basis Path testing Prime Number algorithm: control flow graph, Cyclometric Complexity, Basis Path testing						
<b>Targeted Application &amp; Tools that can be used:</b> Testing the Software/Program/Application using White and Block Box Testing. Tools : Bug Zilla Tool for Bug reporting and writing						
Project Work / Assignment / Case Study						

After completion of each module a programming-based Assignment/Assessment will be conducted. A Scenario / Case Study will be given to the students to test the Program / Application.

Text Books

Ralf Bierig, Stephen Brown, Edgar Galvan, Joe Timoney, “*Essentials of Software Testing*”, Cambridge University Press, 2021.

[https://assets.cambridge.org/97811088/33349/frontmatter/9781108833349\\_frontmatter.pdf](https://assets.cambridge.org/97811088/33349/frontmatter/9781108833349_frontmatter.pdf)

Srinivasan Desikan and Gopaldaswamy Ramesh, “*Software Testing – Principles and Practices*”, Pearson Education, 2016.

<http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6549>

Paul. C. Jorgensen “*Software Testing- A Craftsman’s Approach*”, 4th Edition. CRC PRESS, 2019.

<https://malenezi.github.io/malenezi/SE401/Books/Software-Testing-A-Craftsman-s-Approach-Fourth-Edition-Paul-C-Jorgensen.pdf>

References

Cem Kaner, Jack Falk, Hung Q. Nguyen, “*Testing Computer Software*”, Second edition, Wiley 2015.

<https://www.pdfdrive.com/testing-computer-software-d8618500.html>

Aditya P. Mathur, “*Foundations of Software Testing \_ Fundamental Algorithms and Techniques*”, Pearson Education, 2015

<http://182.72.188.195/cgi-bin/koha/opac->

[detail.pl?biblionumber=6096&query\\_desc=kw%2Cwrdl%3A%20Foundations%20of%20Software%20Testing](http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6096&query_desc=kw%2Cwrdl%3A%20Foundations%20of%20Software%20Testing)

Kshirasagar Naik, Priyadarshi Tripathy “*Software Testing and Quality Assurance Theory and Practice*”, Wiley and sons, 2016.

<http://182.72.188.195/cgi-bin/koha/opac->

[detail.pl?biblionumber=13587&query\\_desc=kw%2Cwrdl%3A%20Software%20Testing%20and%20Quality%20Assurance](http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=13587&query_desc=kw%2Cwrdl%3A%20Software%20Testing%20and%20Quality%20Assurance)

Topics relevant to development of “Employability”: Writing Test cases for Problems, Bug Reporting, Basics of Software Test Automation – Software Testing Metrics for Employability through Experiential learning techniques. This is attained through assessment component mentioned in the course handout.



**CSA2008      Essentials of Cloud Computing**

Course Code: CSA2008	Course Title: Essentials of Cloud Computing Type of Course: Program Core	L-T-P- C	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Computer Networks					
Anti-requisites	NIL					
Course Description	<p>This course aims to introduce the core concepts of cloud computing to gain the foundational knowledge required for understanding cloud computing from a business perspective as also for becoming a cloud practitioner. From the course student will understand the definition and essential characteristics of cloud computing, its history, the business case for cloud computing, and emerging technology use cases enabled by cloud.</p> <p>This course covers on various cloud service models (IaaS, PaaS, SaaS), deployment models (Public, Private, Hybrid), the key components of a cloud infrastructure (VMs, Networking, Storage - File, Block, Object) and security issues in the cloud.</p>					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Essentials of Cloud Computing and attain Skill Development through Participative Learning techniques.					
Course Out Comes	<p>On successful completion of this course the students shall be able to:</p> <p>Understand the significance of Cloud computing technologies.[Knowledge] Identify appropriate Virtualization techniques to virtualize infrastructures. [Comprehension] Demonstrate the different services provided by cloud [Application] Analyze cloud security issues in cloud computing. [Comprehension]</p>					
Course Content:						
Module 1	Introduction to Cloud (Comprehension)	Quiz				10 Hours
<p>Topics: Cloud computing basics: - Cloud computing components- Infrastructure-services- storage applications database services – Deployment models of Cloud- Services offered by Cloud- Benefits and Limitations of Cloud Computing</p>						
Module 2	Virtualization fundamentals(Co mprehension)	Assignment				10 Hours
<p>Topics: Virtualization – Enabling technology for cloud computing- Types of Virtualization- Server Virtualization- Desktop Virtualization – Memory Virtualization – Application and Storage Virtualization- Tools and Products available for Virtualization.</p>						
Module 3	Cloud Services(SAAS, PAAS,IAAS)(Co mprehension)	Seminar				10 Hours
<p>Topics: Getting started with SaaS - Understanding the multitenant nature of SaaS solutions- Understanding Open SaaS Solutions. Understanding Service Oriented Architecture PaaS- Benefits and Limitations of PaaS, Security as a Service, Understanding IaaS- Improving performance through Load balancing- Server Types within IaaS solutions- Utilizing cloud based NAS devices – Understanding Cloud based data storage- Cloud based database solutions- Cloud based block storage</p>						
Module 4	Cloud Computing Software Security Fundamentals(Co mprehension)	Test				10 Hours

Topics:

Cloud Information Security Objectives, Cloud Security Services , Authentication , Authorization, Auditing, Accountability, Secure Cloud Software Requirements, Secure Development Practices, Approaches to Cloud Software Requirements Engineering.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Problem Solving: Design and implement dynamic resource allocation for virtual machine using cloud computing environment.

Text Book

R. Buyya, C. Vecchiola, S T. Selvi, Mastering Cloud Computing, McGraw Hill (India) Pvt Ltd., 2013.  
Ronald L.Krutz, Russell vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley Publishing Inc., 2010.

References

Douglas E. Comer, "The Cloud Computing Book: The Future of Computing Explained", Chapman and Hall/CRC; 1st edition, July 2021.  
Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, "Virtualization, Business Models, Mobile, Security and more, Jones & Bartlett Learning Company, 2013  
Gautam Shroff, Enterprise Cloud Computing - Technology, Architecture, Applications, Cambridge University Press, 2010

Topics relevant to "SKILL DEVELOPMENT":

Virtualization, SaaS, Cloud Information Security for Skill development through Participative Learning techniques. This is attained through the assessment component mentioned in the course handout.

**CSAXXXX MACHINE LEARNING ALGORITHMS**

Course Code: CSA3002	Course Title: MACHINE LEARNING ALGORITHMS	L-T-P-C	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Programming in Python (CSA1004)					
Anti-requisites	Nil					
Course Description	A machine learning algorithm is a mathematical or computational procedure that is designed to learn patterns and relationships from data, and use that knowledge to make predictions, classifications, or decisions. These algorithms form the core building blocks of machine learning systems and enable computers to automatically learn from and analyze large amounts of data. The development and implementation of machine learning algorithms require careful consideration of factors such as data quality, feature engineering, model selection, hyperparameter tuning, and evaluation techniques to ensure reliable and accurate results.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Machine Learning Algorithms and attain Skill Development through Experiential Learning techniques.					
Course Outcomes	Knowledge of training and testing the datasets using machine Learning techniques. Apply optimization and parameter tuning techniques for machine Learning algorithms. Apply a machine learning model to solve various problems using machine learning algorithms. Design models through machine learning algorithm.					
Course Content:						
Module 1	Introduction to Machine Learning Algorithms	Assignment				8 Sessions
Topics: Introduction: History and Concept of machine learning, chronological overview of machine learning algorithms, Machine learning methods example: Supervised Learning-Linear Regression, Unsupervised Learning-Principal Component Analysis (PCA), Ensemble Methods- Bagging using Random Forests.						
Module 2	Introduction to machine learning techniques	Assignment				7 Sessions
Topics: Machine learning techniques example: Feature Selection/Extraction Techniques-Principal Component Analysis (PCA), Regularization Techniques- L1 Regularization (Lasso), Sampling Techniques-Over sampling(Synthetic Minority Over-sampling Technique (SMOTE)), Hyperparameter Optimization Techniques- Bayesian Optimization, Text Processing Techniques - Tokenization, Data Augmentation Techniques- Image Augmentation.						
Module 3	Knowledge management	Case Study				8 Sessions
Topics: Building machine learning models - Recognizing handwritten digits in image classification tasks, Identifying frequently co-occurring items in market basket analysis, and Image classification, object detection, and recognition tasks.						
Module 4	Capstone project	Case Study and Project				7 Sessions
Topics:						

Image Classification: Apply a model that can accurately classify images into different categories, such as identifying different species of flowers, recognizing handwritten digits, or detecting objects in images,  
Recommendation System: Apply a recommendation system that suggests relevant items to users based on their preferences, such as building a movie recommendation system, suggesting products to online shoppers, or recommending personalized news articles.

Targeted Application & Tools that can be used:

Linux / Vi Editor

Project work/Assignment:

Text Books

Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python" Wiley, First Edition 2019.

"Pattern Recognition and Machine Learning" by Christopher Bishop: This book provides a comprehensive introduction to machine learning, covering both classical and modern techniques. It covers topics such as Bayesian methods, support vector machines, neural networks, and deep learning.

Web References

<https://nptel.ac.in/courses/>

<https://www.udemy.com/course/>

<https://www.coursera.org/learn/>

Topics relevant to "SKILL DEVELOPMENT":

Exploratory Data Analysis and Regression Analysis for Skill development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

**CSAXXXX MACHINE LEARNING ALGORITHMS LAB**

Course Code: CSAXXXX	Course Title: MACHINE LEARNING ALGORITHMS	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	Nil					
Course Description	A machine learning algorithm is a mathematical or computational procedure that is designed to learn patterns and relationships from data, and use that knowledge to make predictions, classifications, or decisions. These algorithms form the core building blocks of machine learning systems and enable computers to automatically learn from and analyze large amounts of data. The development and implementation of machine learning algorithms require careful consideration of factors such as data quality, feature engineering, model selection, hyperparameter tuning, and evaluation techniques to ensure reliable and accurate results.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Machine Learning Algorithms Lab and attain Skill Development through Experiential Learning techniques.					
Course Outcomes	Knowledge of training and testing the datasets using machine Learning techniques. Apply optimization and parameter tuning techniques for machine Learning algorithms. Apply a machine learning model to solve various problems using machine learning algorithms. Design a model through machine learning algorithm.					
Course Content:						
Module 1	Introduction to Machine Learning Algorithms	Assignment				8 Sessions
Topics: Introduction: History and Concept of machine learning, chronological overview of machine learning algorithms, Machine learning methods example: Supervised Learning-Linear Regression, Unsupervised Learning-Principal Component Analysis (PCA), Ensemble Methods- Bagging using Random Fores.						
Module 2	Introduction to machine learning techniques	Assignment				7 Sessions
Topics: Machine learning techniques example: Feature Selection/Extraction Techniques-Principal Component Analysis (PCA), Regularization Techniques- L1 Regularization (Lasso), Sampling Techniques-Oversampling(Synthetic Minority Over-sampling Technique (SMOTE)), Hyperparameter Optimization Techniques- Bayesian Optimization, Text Processing Techniques - Tokenization, Data Augmentation Techniques- Image Augmentation.						
Module 3	Knowledge management	Case Study				8 Sessions

Topics:  
Building machine learning models - Recognizing handwritten digits in image classification tasks, Identifying frequently co-occurring items in market basket analysis, and Image classification, object detection, and recognition tasks.

Module 4	Capestone project	Case Study and Project	7 Sessions
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Topics:  
Image Classification: Apply a model that can accurately classify images into different categories, such as identifying different species of flowers, recognizing handwritten digits, or detecting objects in images,  
Recommendation System: Apply a recommendation system that suggests relevant items to users based on their preferences, such as building a movie recommendation system, suggesting products to online shoppers, or recommending personalized news articles.

Targeted Application & Tools that can be used:

Linux / Vi Editor

Project work/Assignment:

Assignment:  
Lab Experiments: Use UCI repository and Kaggle dataset for each experiments. Exp1:  
(Two Session)  
Level1: Introduction to Python Stack for Data Science, Core Python Libraries for data analysis, Anaconda platform and its installation, Executing programs on Jupiter IDE.  
Level2: Write a Python program that utilizes expressions, types, statements, and variables to work with a simple dataset.  
Experiment 2(Two Session)  
Linear Regression: Implement linear regression to predict a continuous target variable based on input features.  
Experiment 3 (Two Session)  
Level1: Logistic Regression: Build a logistic regression model for binary classification problems. Level2:  
Logistic Regression: Build a logistic regression model for Multi classification problems.  
Experiment 4 (Two Session)  
Principal Component Analysis (PCA): Implement PCA to reduce the dimensionality of data by projecting it onto a lower-dimensional space.  
Experiment 5 (Two Session)  
Neural Networks: Implement a basic neural network model using libraries like TensorFlow or Keras for tasks like image classification.  
Experiment 6 (Two Session)  
Level1: Implement a basic ANN model using TensorFlow or Keras for image classification tasks. Train the model on a labeled image dataset (e.g., MNIST or CIFAR-10) and evaluate its performance.  
Level2: Use a dataset containing user-item ratings and build a model to recommend items based on user preferences

Text Books

Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python" Wiley, First Edition 2019.

"Pattern Recognition and Machine Learning" by Christopher Bishop: This book provides a comprehensive introduction to machine learning, covering both classical and modern techniques. It covers topics such as Bayesian methods, support vector machines, neural networks, and deep learning.

Web References

<https://nptel.ac.in/courses/>

<https://www.udemy.com/course/>

<https://www.coursera.org/learn/>

Topics relevant to "SKILL DEVELOPMENT":

Exploratory Data Analysis and Regression Analysis for Skill development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

**CSA3069      Data management Using Cloud**

Course Code: CSA3069	Course Title: Data management Using Cloud Type of Course: Discipline elective	L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	Basics of Distributed Computing, Service Oriented Architecture					
Anti-requisites	NIL					
Course Description	This Course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. Cloud Computing has emerged in recent years as a new paradigm for hosting and delivering services over the Internet. The students can explore various Cloud Computing terminology, principles and applications. Understanding different views of the Cloud Computing such as theoretical, technical and commercial aspects.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Data management Using Cloud Computing attain <b>Employability</b> through <b>Experiential Learning</b> techniques					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Describe fundamentals of cloud computing, virtualization and cloud computing services. 2. Discuss high-throughput and data-intensive computing. 3. Explain security and standards in cloud computing. 4. Demonstrate the installation and configuration of virtual machine.					
Course Content:						
Module 1	Introduction to Cloud and Virtualization	Assignment	Data Collection	10 Sessions		
Topics: Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Computing Platforms and Technologies, Virtualization, Characteristics of Virtualized Environments Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Technology Examples, Cloud Computing Architecture, IaaS, PaaS, SaaS, Types of Clouds, Economics of Cloud.						
Module 2	High Throughput and Data Intensive Computing	Quiz	Problem Solving	10 Sessions		
Topics: Task computing, MPI applications, Task based programming, Introduction to DIC, Technologies for DIC, Aneka Map Reduce Programming.						
Module 3	Cloud Security and Standards	Assignment	Problem Solving	7 Sessions		
Topics: Cloud Security Challenges, Software-as-a-Service Security, Application standards, Client standards, Infrastructure and Service standards.						
Module 4	Cloud Platforms: Amazon Web Services	Assignment	Problem Solving	9 Sessions		
Communication Services, Additional Services, Google App Engine: Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure: Core Concepts, SQL Azure, Windows Azure Platform Appliance, Observations. Demonstration of VM setup and configuration						

**Project work/Assignment:**

**Project Assignment:**

1) Project on domain related cases studies.

**Assignment:**

- 1] Characteristics and benefits of cloud computing.
- 2] SaaS 2.0 applications.
- 3] Explain high-performance computing, high-throughput computing.
- 4] Explain Windows Azure Platform Appliance.

**Text Book**

T1 John Rittinghouse and James Ransome, “Cloud Computing, Implementation, Management and Security”, CRC Press.

T2 Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education.

**References**

R1 David E.Y. Sarna, “Implementing and Developing Cloud Applications”, CRC Press.

R2 Anthony T Velte, Toby J Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Tata McGraw-Hill.

R3 Web resources: W1. IEEE Transactions on Cloud Computing-  
<https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519>

Web resources: W2. International Journal of Cloud Computing-  
<https://www.inderscience.com/jhome.php?jcode=ijcc>

Topics relevant to “EMPLOYABILITY DEVELOPMENT”: Client standards, Infrastructure and Service standards. developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in the course handout.



### CSA2007 Data Mining

Course Code: CSA2007	Course Title: Data Mining Type of Course: Program Core - Theory	L-T- P- C	2	1	0	3
Version No.	1					
Course Pre-requisites	Students are expected to be familiar with the basics of Linear Algebra, Probability and Statistics and should have a knowledge on DBMS.					
Anti-requisites	NIL					
Course Description	The purpose of this Course is to introduce the students to issues in data mining, data pre- processing techniques, data mining tasks, association rules, advanced association rules, classification, and different approaches for classification, clustering, and outlier detection. Topics include: Association rule mining, classification, clustering and outlier detection.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Data Mining and attain Skill Development through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO 1) Explain the basic concepts and issues involved in Data Mining. (Knowledge) CO 2) Discuss different preprocessing techniques on Data Analysis.(Comprehension) CO 3) Discover frequent item sets by using Association rule algorithms. (Application) CO 4) Apply different Classification and Clustering techniques used in data mining. (Application)					
Course Content:						
Module 1		Assignment				05 Sessions
Introduction to Data mining – Data Mining Goals– Stages of the Data Mining Process–Data Mining Techniques– Applications.						
Module 2		Assignment				09 Sessions
Types of data – Data Quality – Data Preprocessing Techniques – Similarity and Dissimilarity measures.						
Module 3						07 Sessions
Motivation and terminology – Basic idea: item sets – Generating frequent item sets and rules efficiently – Apriori Algorithm– FP Growth.						
Module 4		Assignment				12 SESSIONS
Decision tree Induction – Bayesian classification – Rule based classification – Classification by Back Propagation - Lazy learners – Modern evaluation and selection techniques to improve classification accuracy. Clustering Analysis – partitioning method – Hierarchical methods –Basics of Density based method – Grid based methods.						
Module 5		Assignment				05 SESSIONS
Anomaly detection preliminaries - Different Outlier detection techniques-Web mining- Textmining- Data mining software Application.						
Targeted Application & Tools that can be used: Implementation of decision tree approaches.						
Project work/Assignment:						

Project Assignment:

Assignment 1: Module 1, 2

Assignment 2: Module 4,5

**Textbooks:**

T1 :Tan P. N., Steinbach M & Kumar V. “Introduction to Data Mining”, Pearson Education, 2016.

**References:**

R1. Han J & Kamber M, “Data Mining: Concepts and Techniques”, Elsevier, Second Edition, 2006

R2. G K Gupta, “Introduction to Data Mining with Case Studies”, PHI, Third Edition, 2014.

R3. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill.

Web references:

<https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2233842&site=ehost-live>

<https://nptel.ac.in/courses/105106053>

**Topics relevant to “SKILL DEVELOPMENT”:** The concepts of Bayesian classification – Rule based classification – Classification by Back Propagation - Lazy learners – Modern evaluation and selection techniques for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in the course handout.

**CSA2115 Statistical Analysis using R Programming**

<b>Course Code:</b> <b>CSA2115</b>	<b>Course Title: Statistical Analysis using R Programming</b>			L-T-P-C	0	0	4	2
	<b>Type of Course:</b> Lab Course							
<b>Version No.</b>	1							
<b>Course Pre-requisites</b>	NIL							
<b>Anti-requisites</b>	NIL							
<b>Course Description</b>	This course introduces fundamental and advanced statistical techniques using R Programming for data analysis. Students will learn data manipulation, visualization, hypothesis testing, regression analysis, and machine learning techniques in R. The course covers both descriptive and inferential statistics, enabling students to interpret real-world datasets effectively. Hands-on sessions with R packages like ggplot2, dplyr, and caret will enhance analytical skills. By the end of the course, students will be able to apply statistical methods to solve complex data-driven problems.							
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of Statistical Analysis using R Programming attain Employability Skills through Experiential Learning techniques.							
<b>Course Out Comes</b>	<p>On successful completion of this course the students shall be able to:</p> <ul style="list-style-type: none"> <li>• Apply basic R functions pertaining to fundamental data analysis. [Application]</li> <li>• Interpret data using appropriate statistical methods [Application]</li> <li>• Demonstrate the decision trees concept with the given dataset. [Application]</li> <li>• Demonstrate the Mining concepts for both Data and Text. [Application]</li> </ul>							
<b>Course Content:</b>								
<b>Module 1</b>	Introduction	Assignment	Data Collection/Interpretation	15 Sessions				
<b>Topics:</b> Introduction to R, Overview of data analysis, Working with directory in R, Loading and handling data in R, Data Visualization with ggplot2, Data Transformation with dplyr.								
<b>Module 2</b>	Exploratory Data Analysis	Coding Assignment	Case Study	15 Sessions				
<b>Topics:</b> Exploring a new dataset, Anomalies in numerical data, Visualizing relations between variables, Assumptions of Linear Regression, Validating Linear Assumption, Missing Values, Covariation, Patterns and Models, ggplot2 Calls.								
<b>Module 3</b>	Regression Analysis	Coding Assignment	Project	15 Sessions				
<b>Topics:</b>								

Introduction, Types of Regression Analysis Models, Linear Regression, Simple Linear Regression, Non-Linear Regression, Regression Analysis with Multiple Variables, Cross Validation, Principal Component Analysis, Factor Analysis.

Module 4	Classification	Quiz	Project	15 Sessions
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Topics:  
Introduction, Different types of Classification, Logistic Regression, Support Vector Machines, K-Nearest Neighbors, Naïve Bayes Classifier, Decision Tree Classification, Random Forest Classification, Evaluation.

**List of Laboratory Tasks:**

1. Using with and without R objects on console
2. Using mathematical functions on console
3. Write an R script, to create R objects for calculator
4. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.
5. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R
6. Find the data distributions using box and scatter plot.
7. Find the outliers using plot.
8. Plot the histogram, bar chart and pie chart on sample data
9. Find the correlation matrix.
10. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data
11. Create a regression model for a given dataset
12. Install relevant package for classification.
13. Choose classifier for classification problem. c. Evaluate the performance of classifier.
14. Install relevant package for classification.
15. Choose classifier for classification problem. c. Evaluate the performance of classifier.

**Targeted Application & Tools that can be used**

Tools: RStudio / Google Colab

**Project work/Assignment:**

Assignment:  
During the course, students would need to do coding assignments to learn to train and use different models. Sample coding assignments include:  
Analysis of Sales Report of a Clothes Manufacturing Outlet.  
Comcast Telecom Consumer Complaints.  
Web Data Anlysis

**Text Book**

T1 Hadley Wickham and Garrett Golemund, “R for Data Science”, O’reilly, 2017.

**References**

R1 Dr. Bharati Motwani, “Data Analytics using R”, Wiley, 2019.

**Web resources:**

- <https://www.geeksforgeeks.org/r-programming-for-data-science/>
- <https://r4ds.had.co.nz/>

Topics relevant to “EMPLOYABILITY DEVELOPMENT”: Exploratory Data Analysis, Regression Analysis for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in the course handout.

## Discipline Electives

### CSA2110 NET Programming Using C#

<b>Course Code:</b> CSA2110	<b>Course Title:</b> .NET Programming Using C# <b>Type of Course:</b> Program Core - Laboratory integrated	<b>L- T -P- C</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>
<b>Version No.</b>	1.1					
<b>Course Pre-requisites</b>	Familiarity with any programming language such as C, C++, Java, or Python including Basic knowledge of OOP concepts, including classes, objects, inheritance, polymorphism, and encapsulation					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This course provides an in-depth exploration of .NET programming using C#, enabling students to design and develop modern applications efficiently. The students will gain a solid foundation in the .NET framework and C# programming language, focusing on object-oriented principles, graphical user interface development, web and desktop application creation, and integration with databases. The course also emphasizes best practices and design patterns, ensuring the development of robust, scalable, and secure applications.					
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of .Net Framework architectures, C# Programming language and attain <b>SKILL DEVELOPMENT</b> through <b>EXPERIENTIAL LEARNING</b> techniques.					
<b>Course Out Comes</b>	On successful completion of this course the students shall be able to:  <ol style="list-style-type: none"> <li>1. Use OOPS concepts in C# for solutions to real-world problems [<b>Apply</b>]</li> <li>2. Design and implement robust console-based and desktop applications using C# and the .NET framework. [<b>Apply</b>]</li> <li>3. Create interactive GUI-based applications in C# to enhance user experience. [<b>Apply</b>]</li> <li>4. Develop database-driven applications using ADO.NET for efficient data management [<b>Apply</b>]</li> </ol>					
<b>Course Content:</b>						
<b>Module 1</b>	Introduction to .NET Framework	Assignment	Programming Task	<b>18 Sessions</b>		
<b>Topics:</b> Understanding .NET Framework: An overview of the .NET, Key benefits of .NET Platform, Introduction to .NET framework and .NET, Architecture-.Net Framework Class Libraries-CLR- Name Space, Assemblies, MSIL, Understanding Common Type Systems (CTS), Common Language Specifications, Introduction to Visual Studio.Net, Languages supported by .NET, Different Applications of .NET.						

<b>Module 2</b>	C# Language Basics	Assignment	Programming Task	<b>22 Sessions</b>
<p><b>Topics:</b> The C# Language: Working with system Data Types and C# Keywords, Literals, and Variables, Operators, Type Conversion and Casting, Program Control Statements, Looping Statements, Understanding Arrays and Strings, Methods and Classes. Collections. Collections. Introduction to Windows Forms- The System Windows.Forms Namespace, Windows Forms Development, Windows Forms and Web Services</p>				
<b>Module 3</b>	Object oriented with C#:	Assignment	Programming Tasks	<b>23 Sessions</b>
<p>The architecture of a class in C#, Instance, Class &amp; Reference variables, Access Modifier, Abstract Classes, Constructors, Destructors, Inheritance in C#, Method Overloading, Method Overriding, Operator Overloading, Method Hiding, Access modifies: private, public, protected, internal, protected internal, new, Abstract classes, Sealed classes, Creating Interfaces, Implementing Interface inheritance.</p>				
<b>Module 4</b>	Database Programming Using ADO.NET	Assignment	Programming Tasks	<b>27 Sessions</b>
<p><b>Topics:</b> Application Database Programming Using ADO.NET -Introduction, and Evolution of ADO.NET, Understanding the Role of Managed Provider and ADO.NET Objects, Connecting to Database and Connection Pooling, Performing Insert, Update and Delete Operations, Fetching Data from the database - Executing Select Statements,</p>				
<p><b>List of Laboratory Tasks:</b>  <b>Experiment No. 1:</b>  <b>Level 1:</b> Install Visual Studio, a robust IDE for developing .NET applications on Windows.  <b>Level 2:</b> Identify the Components of Integrated Development Environments.  <b>Experiment No. 2:</b>  <b>Level 1:</b> Identify the types of Projects supported by the .NET Framework  <b>Level 2:</b> Identify the controls that are available for Windows Form Applications. List any 10 Common Controls and their basic Properties  <b>Experiment No. 3:</b>  <b>Level 1:</b> Create a console application in C# that performs basic arithmetic operations (addition, subtraction, multiplication, and division).  <b>Level 2:</b> Create a console application in C# for Simple Interest and Compound Interest  <b>Experiment No 4:</b>  <b>Level 1:</b> University wants to store the student details. Get the student details such as Roll number, fname, lname, Semester, Specialization and display all details. Design a windows application form to accept user input.  <b>Level 2:</b> Design a Windows application to calculate the Simple Interest (SI) by providing Principal (p), Rate(r) and Time (t). Hint: <math>S.I = (p \times r \times t) / 100</math>  <b>Experiment No. 5:</b>  <b>Level 1</b> Write a C# program that calculates the sum of the digits of a given positive integer using the while loop. The program should: <ul style="list-style-type: none"> <li>• Take a positive integer as input from the user.</li> <li>• Use a while loop to extract and add each digit of the number.</li> <li>• Display the final sum of the digits.</li> </ul> <b>Level 2:</b> Write a C# program that takes the marks of a student as input and calculates their grade based on the following criteria: <ul style="list-style-type: none"> <li>• Marks <math>\geq 90</math>: Grade A</li> </ul> </p>				

- Marks  $\geq 80$  and  $< 90$ : Grade B
- Marks  $\geq 70$  and  $< 80$ : Grade C
- Marks  $\geq 60$  and  $< 70$ : Grade D
- Marks  $\geq 50$  and  $< 60$ : Grade E
- Marks  $< 50$ : Fail

**Experiment No. 6:**

**Level 1:** Create a C# Program to implement Vowels Program using Select Case.

**Level 2:** Create a C# program to Print Fibonacci Series for the given input

**Experiment No 7:**

**Level 1:** Define a class 'student' with data members **stno, stname and age**. Also include following: **Default Constructor and parameterized constructor**. Display method to show all details.

**Level 2:** Design a class to represent a bank account. Include the following members: Data Members: - Name of the depositor, Account Number, Type of Account, Balance amount in the account and methods : To assign initial values, To deposit an amount, To withdraw an amount after checking balance, To display name and the balance. Write a c# program to demonstrate the working of the various class members

**Experiment No. 8:**

**Level 1:** Design a class to represent a bank account. Include the following members: Data Members: - Name of the depositor, Account Number, Type of Account, Balance amount in the account and methods : To assign initial values, To deposit an amount, To withdraw an amount after checking balance, To display name and the balance. Write a c# program to demonstrate the working of the various class members.

**Level 2:** Write a C# Program to find out the area of the triangle, square, and rectangle using method overloading.

**Experiment No. 9:**

**Level 1:** Write a C# program where the Student class inherits from the Person class. The Person class contains Name and Age properties, and the Student class adds the Course property. Display the information of a student by calling both the Person and Student methods.

**Level 2:** Write a C# program where the Teacher class inherits from the Person class. Override the DisplayInfo method in the Teacher class to show both the teacher's personal information and their subject.

**Experiment No. 10:**

**Level 1:** Create a Class called Rectangle and store length, width using constructor. Calculate the area using that. Create tabletop using rectangle class and calculate the cost of painting that table top. (Use single inheritance)

**Level 2:** Admin executive of the university is entering the university name for the students. If he enters the name wrongly, exception should be raised.

**Experiment No. 11:**

**Level 1:** Demonstrates how to overload the == operator to compare two string-like objects for equality.

**Level 2:** Demonstrates how to overload the + operator to add two complex numbers

**Experiment No. 12:**

**Level 1:** Develop a C# program to establish a connection to an SQL Server database. The program should include steps for specifying the connection string, opening the connection, handling any potential errors, and then properly closing the connection

**Level 2:** Write a detailed C# program that establishes a connection to a SQL Server database and inserts a new record into a specified database table

**Experiment No. 13:**

**Level 1:** Design a Table Student with the following fields:

- StudId Int Primary Key
- Studname nchar(10)
- Course\_Name nchar(10)
- Semester int

Demonstrate a C# code to display students' details.

**Level 2:** Write a C# code to show the concept Stack

**Experiment No. 14:**

**Level 1:** Design and implement a **Student Information System (SIS)** that interacts with a SQL Server database for the following functionalities:

1. **Add a New Student**
2. **View All Students**
3. **Delete a student**

**Level 2** Design and implement a **Employee Information System (SIS)** that interacts with a SQL Server database for the following functionalities:

1. **Add a New Student**
2. **View All Students**
3. **Pay Slip**

**Experiment No. 15:**

**Level 1:** Design a program to create a text file, write user input to it, and then read and display the content.

**Level 2** Create a program to append new content to an existing file without overwriting its current content.

**Text Book**

1. Andrew Troelsen Philip Japikse, "Pro C# 10 with .NET 6 Foundational Principles and Practices in Programming", 11<sup>th</sup> Edition, Apress Publishers, USA, 2022. [ISBN- 978-1-4842-7868-0].
2. Herbert Schildt, "C# 4.0: The Complete Reference", Tata McGraw-Hill Publishers, 4<sup>th</sup> Edition, 2017 [ISBN: 978-0-07-174117-0].
3. Joseph Albahar, "C# 12 in a Nutshell the Definitive Reference", 1<sup>st</sup> Edition, O'Reilly Media, Inc., 2024, [ISBN: 978-1-098-14744-0].

**References**

1. Thuan L. Thai ".Net Framework Essentials: Introducing the .net Framework", O'reilly Media Inc 2004, [ISBN: 978-0-59-600505-4]
2. Mark J. Price, "C# 12 and .NET 8 – Modern Cross-Platform Development Fundamentals", 8<sup>th</sup> Edition, Packt Publishing, 2023 [ISBN 978-1-83763-587-0].

**Web Based Resources and E-books:**

1. <https://www.codecademy.com/learn/learn-c-sharp>
2. <https://dotnet.microsoft.com/en-us/learn/csharp>
3. <https://www.learncs.org/>
4. <https://www.codechef.com/learn/course/c-sharp>
5. <https://csharp-station.com/>

Topics relevant to "**SKILL DEVELOPMENT** Methods and Classes. Collections , Object oriented with C#, ADO.NET for developing Skills through **PARTICIPATIVE LEARNING** techniques. This is attained through assessment component mentioned in the course handout.



## CSA2111 No SQL

<b>Course Code:</b> CSAXXX X	<b>Course Title:</b> No SQL		<b>L-T-P-C</b>	0	0	6	3
	<b>Type of Course:</b> Program Lab						
<b>Version No.</b>	2.0						
<b>Course Pre-requisites</b>	<ul style="list-style-type: none"> <li>• Basic understanding of database concepts.</li> <li>• Familiarity with SQL and relational database management systems.</li> </ul>						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	<p>This course provides an in-depth understanding of NoSQL databases, their architecture, and their applications in modern data-driven environments. Students will explore the key concepts, types, and use cases of NoSQL databases, focusing on their scalability, flexibility, and performance advantages over traditional relational databases. The course covers various NoSQL database models, including Key-Value, Document-Oriented, Column-Family, and Graph Databases, with practical examples and hands-on experience. Students will gain the skills to design, implement, and manage NoSQL databases for real-world applications such as Big Data, IoT, and E-commerce systems.</p>						
<b>Course Objective</b>	<p>This course aims to equip BCA students with foundational knowledge and practical skills in NoSQL databases, focusing on their architecture, types, and applications. Students will learn to design, implement, and manage scalable, distributed systems using popular NoSQL databases like MongoDB, Cassandra, and Neo4j.</p>						
<b>Course Out Comes</b>	<p>Upon successful completion of this course, students will be able to:</p> <p>CO 1: Understand NoSQL Fundamentals</p> <p>CO 2: Perform Practical NoSQL Operations</p> <p>CO 3: Design Scalable Systems</p> <p>CO 4: Apply NoSQL in Real-World Scenarios</p>						
<b>Course Content:</b>							
<b>Module 1</b>	<b>Introduction to NoSQL Databases</b>	Quiz/Short Test	Quizzes form basics of NoSQL			<b>18 Sessions</b>	
<p>Overview of NoSQL and its importance, Differences between SQL and NoSQL databases, Installation and setup of NoSQL databases (MongoDB, Cassandra, Redis, Neo4j) , Introduction to basic NoSQL commands.</p>							
<b>Module 2</b>	<b>Document-Oriented and</b>	Practical Assignme nt	Viva and Lab exam			<b>18 Sessions</b>	

	<b>Key-Value Databases</b>			
Understanding document-oriented databases (MongoDB) , CRUD operations in MongoDB, Data modeling and schema design in MongoDB, Introduction to key-value stores (Redis) , Working with Redis data structures (strings, lists, sets, and hashes).				
<b>Module 3</b>	<b>Column-Family Databases (Cassandra)</b>	Case Study & Report	Comprehension based Quizzes and Practical Examination	<b>18 Sessions</b>
Introduction to column-family databases and their architecture, Basics of Apache Cassandra and its use cases , Creating keyspaces and tables in Cassandra, Performing CRUD operations using CQL (Cassandra Query Language) , Data partitioning, replication, and consistency in Cassandra.				
<b>Module 4</b>	<b>Graph Databases (Neo4j)</b>	Final Project & Presentation	Lab exam/ Demo	<b>18 Sessions</b>
Introduction to graph databases and their applications Nodes, relationships, and properties in Neo4j , Querying graph databases using Cypher ,Real-world use cases of graph databases..				
<b>Module 5</b>	<b>Advanced Topics and Capstone Project</b>	Final Project & Presentation	Lab exam/ Demo	<b>18 Sessions</b>
Indexing, aggregation, and performance optimization in MongoDB, Sharding and replication in NoSQL databases, Security and access control in NoSQL databases, Hands-on capstone project integrating NoSQL databases.				
<p><b>List of Laboratory Tasks:</b>  This lab syllabus provides hands-on experience with various NoSQL databases and their applications, building practical skills in data modeling, querying, and performance optimization:</p> <p><b>Experiment 1: Introduction and types of NoSQL Databases</b></p> <p><b>Experiment 2: Introduction and Installation of MongoDB</b></p> <p><b>Experiment 3: Basic CRUD Operations with MongoDB</b></p> <p><b>Experiment 4: Introduction and Setup of Cassandra</b></p> <p><b>Experiment 5: Data Modeling and Simple Queries with Cassandra</b></p> <p><b>Experiment 6: Introduction to Neo4j Graph Databases</b></p> <p><b>Experiment 7: Basic Graph Queries and Implementations with Neo4j</b></p> <p><b>Experiment 8: Redis Basics: Introduction and Key-Value Operations</b></p>				

## Experiment 9: Final Project

These experiments cover essential NoSQL concepts and give BCA students practical experience with popular NoSQL databases like MongoDB, Cassandra, Redis, and Neo4j.

**Targeted Application & Tools that can be used:** NA

### Assignment:

1. Assignments in NoSQL for the students are provided at the end of each module and must be submitted by students within the specified deadline.

### Text Book

1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence by Pramod J. Sadalage and Martin Fowler.
2. MongoDB: The Definitive Guide by Kristina Chodorow.
3. Cassandra: The Definitive Guide by Jeff Carpenter and Eben Hewitt.
4. Neo4j in Action by Jonas Partner, Aleksa Vukotic, and Nicki Watt.

### References

1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence by Pramod J. Sadalage and Martin Fowler.
2. MongoDB official documentation: <https://www.mongodb.com/docs/>.
3. Cassandra documentation: <https://cassandra.apache.org/doc/latest/>.

### Topics relevant to “SKILL DEVELOPMENT”:

Students will develop skills in managing and utilizing NoSQL databases like MongoDB, Cassandra, and Neo4j. They will learn to design scalable database architectures, perform complex queries, and implement real-world applications. Additionally, the course focuses on hands-on practice to ensure students can efficiently work with NoSQL in various industries.

**CSA2122 Agile Structures and Frameworks**

<b>Course Code:</b> CSA2122	<b>Course Title: Agile Structures and Frameworks</b> <b>Type of Course: School Core</b>		<b>L- T-P- C</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	Software Engineering						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	<p>This course imparts knowledge to students in the basic concepts of Agile Software Process, methodology and its development</p> <p>The objective of this course is to provide the fundamentals concepts of Agile and its Significance.</p> <p>This course covers the Agile and its methodologies.</p> <p>The objective of the course is to understand the Agility and Assurance.</p>						
<b>Course Objectives</b>	The objective of the course is <b>EMPLOYABILITY</b> of student by using <b>PARTICIPATIVE LEARNING</b> techniques.						
<b>Course Out Comes</b>	<p>On successful completion of this course the students shall be able to:</p> <p>1] Understand the basic concepts of Agile Software Process. <b>(Knowledge level)</b></p> <p>2] Comprehend the various Agile Methodologies. <b>(Comprehension level)</b></p> <p>3] Develop Agile Software Process. <b>(Knowledge level)</b></p> <p>4] Apply principles of Agile Testing. <b>(Application level)</b></p>						
<b>Module 1</b>	<b>Introduction</b>	Assignment	Agile Estimation				<b>08 Sessions</b>
Introduction to Agile technology, Iterative and Evolutionary Methods, Agile – Agile Development. Agile Values, Agile Principles, Compare and Contrast the agile with traditional methods. Agile Benefits. Agile Estimation Techniques. Case Study							
<b>Module 2</b>	<b>Agile and Its Significance</b>	Assignment	Comparison of Agile technologies with traditional methods				<b>09 Sessions</b>
Agile Story : Evolutionary delivery ,Scrum Demo, Planning game, Sprint back log, adaptive planning. Agile Motivation – Problems With The Waterfall - Research Evidence. Scrum : Method Overview ,Life cycle phases and Work product roles and practices.							
<b>Module 3</b>	<b>Agile methodology</b>		Case Study				<b>12 Sessions</b>
Extreme Programming: Method Overview ,Life cycle phases and Work product roles and practices. Unified process : Method Overview ,Life cycle phases and Work product roles and practices. EVO : Method Overview ,Life cycle phases and Work product roles and practices. Case Study.							
<b>Module 4</b>	<b>Agility and Quality Assurance</b>	Assignment	Apply the testing concepts using Programing				<b>09 Sessions</b>

Agile product development – Agile Metrics – Feature Driven Development (FDD). Agile approach to Quality Assurance. Test Driven Development – Agile approach in Global Software Development. Agile Technology Tools.				
<b>Targeted Application &amp; Tools that can be used: JIRA</b>				
<b>Project work/Assignment: Mention the Type of Project /Assignment proposed for this course</b>				
2] Agile Estimation 3] Comparison of Agile technologies with traditional methods 4] Case Study: Student group must collaborate and report together along with assigned batch members. Collect the requirements from the client and adopt the suitable agile practice method for your project 5] Installation and features of JIRA tool.				
<b>Text Book</b>				
1] Craig Larman, “Agile and Iterative Development – A Manager’s Guide”, Pearson Education – 2006 2] Edward Scatter “Brilliant Agile Project Management: A Practical Guide to Using Agile, Scrum and Kanban, 2015				
<b>References</b>				
1] Chetankumar Patel, Muthu Ramachandran, Story Card Maturity Model (SMM): A Process Improvement Framework for Agile Requirements Engineering Practices, Journal of Software, Academy Publishers, Vol 4, No 5 (2009), 422-435, Jul 2009. 2] Hazza& Dubinsky, Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer 2009 3]Kevin C. Desouza, Agile information systems: conceptualization, construction, and management, Butterworth-Heinemann, 2007.				
<b>Web resources:</b>				
<a href="https://presiuniv.knimbus.com/user#/home">https://presiuniv.knimbus.com/user#/home</a>				
<b>Foundation Skills:</b> Students can able to learn the fundamental foundation skills in this course such as agility, agile frame works and quality assurances.				

## CSA1007 Introduction to DevOps

Course Code: CSA1007	Course Title: Introduction to DevOps Type of Course: Integrated	L- T-P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Agile frameworks					
Anti-requisites	NIL					
Course Description	This course is designed to offer profound perceptions and knowledge in various tools like Git, Ansible, Jenkins. With the proficient learning of DevOps course, a student will be able to work in all the above tools and become a trained practitioner in the integration and monitoring of software. DevOps Tool is an application that helps the software development process to industrialize. It mainly focuses on communication and collaboration between product management, software development, and operations professionals. The objective of this course is to discuss and implement the various tools usage and internals practically.					
Course Objective	The objective of the course is SKILL DEVELOPMENT of student by using PARTICIPATIVE LEARNING techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Apply the features and common Git workflow. [Application] CO2: Practice the Docker container and Saving Changes To A Docker Container [Application] CO3: Practice the filters and plugins to populate, manipulate, and manage data used by Ansible Playbooks. [Application] CO4: Interpret the installation and features of Jenkins and build jobs. . [Application]					
Course Content:						
Module 1	Introduction to DEVOPS and GIT Operations	Assignment	Data Collection/Interpretation	10 Sessions		
Topics: Basic Linux Commands, Software Development Lifecycle, Waterfall Model, Agile Model, Lean Methodology, Waterfall Vs Agile Vs Lean, Devops and its tools. Version Control With Git, Introduction to Git, Features of Git, Benefits, Workflow, Git vs GitHub, Installation of Git on Windows/Linux and Environment set up, All Git Commands-Working with local and remote repositories, Running first Git command, Fundamentals of Repository structure and file status life cycle, Working locally with staging, unstaging and commit.						
Module 2	Containerization Using Docker	Case studies	Case studies / Case let	12 Sessions		
Topics: Docker Life Cycle, Docker Installation, Docker Operations, Docker Concepts - Registry, Repository, Tag, Image and Containers, Create A Docker Hub Account, Docker Images and Containers, Pushing Docker To Container Hub, Docker File.						
Module 3	Ansible	Quiz	Case studies / Case let	13 Sessions		

Topics: Ansible Workflow, Architecture, Installation in Linux/Windows, ad-hoc Commands, Playbooks, Tower, Roles, Variables open link, Tags, Galaxy, Commands Cheat Sheets, Modules, Shell, Templates, YAML, Inventory, Debug, Apt, Lineinfile, Copy, Command, File, Vault, Windows, Yum, AWX, Unarchive, Ansible Pip

Module 4	Jenkins	Quiz	Case studies / Case let	10 Sessions
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Topics: Introduction To Continuous Integration, Jenkins Architecture, Managing Nodes On Jenkins, Jenkins Master Node Connection, Jenkins Integration With Devops Tools, Understanding CI/CD Pipelines, Creating A CI/CD Pipeline

**List of Laboratory Tasks:**

**Experiment No 1:** Installation of Git on windows

Level 2: Git commands-Local repositories

Level 2: Git commands-Remote repositories

**Experiment No 2:** How Git can handle automatically file modifications when they are not related to the same lines of text.

Level 1: You are in a new repository located in C:\Repos\Exercises\Ch2-1.

Level 1: You have a master branch with two previous commits: the first commit with a file1.txt file and the second commit with a file2.txt file.

Level 2: After the second commit, you created a new branch called File2Split. You realized that file2.txt is too big, and you want to split its content by creating a new file2a.txt file. Do it, and then commit the modifications

**Experiment No 3:** How to resolve conflicts when Git cannot merge files automatically.

Level 1: You are in the same repository used earlier, C:\Repos\Exercises\Ch2-1. On the master branch, you add the file3.txt file and commit it.

Level 2: Then, you realize that it is better to create a new branch to work on file3.txt, so you create the File3Work branch. You move in this branch, and you start to work on it, committing modifications.

Level 2: The day after, you accidentally move to the master branch and make some modifications on the file3.txt file, committing it. 5. Then, you try to merge it.

**Experiment No 4:** creating Docker container and Saving Changes To A Docker Container

**Level 2:** A Creating A Docker File dvanced program on makefile

**Experiment No 5:** Installation of Ansible

Level 2: Create a basic inventory file

Level 2: Running your first Ad-Hoc Ansible command

**Experiment No 6:** Ansible Archive

Level 1: Compressing the Directory with TAR and tar and gz

Level 1: Compress the file – Default File Compress format and Remove the Source files after archiving

Level 2: Create a ZIP file archive – File and Directory

Level 2: Create a BZIP archive – File and Directory

**Experiment No 7:** Creating Ansible Playbooks

**Experiment No 8:** Introduction and Launching Jenkins as Docker Container

**Experiment No 9:** Initializing Jenkins Plugins and Creating Github Repo

**Experiment No10:** Setup a Jenkins Job with Apache Ant Build Tool

Level 1: Setup a Jenkins Job with Batch Script.

Level 2 Setup a Jenkins Job with Apache Maven

**Experiment No11:** Add a Linux Node (Also Check SSH Slaves plugin plugins)

Level 1: Add a Windows Node

Level 2: Assign a Java Based Job to Linux and Build it

Level 2: Assign a MSBuild Based to Windows and build it

**Project work/Assignment:**

1.Case Studies: At the end of the course students will be given a real-world scenario for any application on devops tools

2. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. [Presidency University Library Link](#).

3. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

#### Text Book

T1. Craig Berg, “*DevOps For Beginners: A Complete Guide to DevOps Best Practices (Including How You Can Create World-Class Agility, Reliability, And Security In Technology Organizations With DevOps) (Code tutorials)*”, Paperback – June 12, 2020.

T2. Ferdinando Santacroce, “*Git Essentials*”, Packt Publishing, April 2015, ISBN: 9781785287909

T3. John Ferguson Smart. “*Jenkins: The Definitive Guide*”, O'Reilly Media, Inc., July 2011, ISBN: 9781449305352

#### References

R1. Jeff Geerling, “*Ansible for DevOps: Server and configuration management for humans*”, Leanpub, August 5, 2020

R2. Unmesh Gundecha, Carl Cocchiaro, “*Learn Selenium*”, Packt Publishing, July 2019, ISBN: 9781838983048

R3. Gaurav Agarwal, “*Modern DevOps Practices: Implement and secure DevOps in the public cloud with cutting-edge tools, tips, tricks, and techniques*”, July 2021.

R4. Mikael Krief, “*Learning DevOps: The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps*”, October 2019

#### E-books :

1. [https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp\\_xiii](https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii)

2. <https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live>

#### R3 Web resources:

W1. Information about GIT <https://git-scm.com/book/en/v2>

W2. Tutorials on GIT <https://www.simplilearn.com/tutorials/git-tutorial/git-tutorial-for-beginner>

W3. Basics of Ansible <https://www.javatpoint.com/ansible>

W4. Jenkin plugin informations [https://www.tutorialspoint.com/jenkins/jenkins\\_managing\\_plugins.htm](https://www.tutorialspoint.com/jenkins/jenkins_managing_plugins.htm)

W5. NPTEL course on devops : <https://nptel.ac.in/courses/128106012>

W6. [https://presiuniv.knimbus.com/user#/searchresultsearchId=eBook&curPage=0&layout=grid&sortFieldId=none&topresult=false&content=\\*cloud\\*](https://presiuniv.knimbus.com/user#/searchresultsearchId=eBook&curPage=0&layout=grid&sortFieldId=none&topresult=false&content=*cloud*)

Topics relevant to development of “Foundation skill”: Software Development Lifecycle

Topics relevant to development of “Employability skills”: Docker, Ansible, Jenkins



**CSA 2112 : Front - End Development Using Javascript**

<b>Course Code:</b> CSA2112	<b>Course Title:</b> Front-end Development using Javascript	<b>L- T- P- C</b>	0	0	6	3
<b>Version No.</b>	2.0					
<b>Course Pre-requisites</b>	NIL					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This intermediate course enables students to perform front-end development using Javascript, with emphasis on employability skills. The course covers key technologies and architectures that enables the student to design and implement front-end. On successful completion of this course, the student shall be able to pursue a career in front end development. The students shall develop strong problem-solving skills as part of this course.					
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of <b>Front-end Development using Javascripts</b> and attain <b>Employability Skills</b> through <b>Experiential Learning</b> techniques.					
<b>Course Outcomes</b>	On successful completion of the course the students shall be able to: CO1. Design and develop static web pages using HTML5 elements and CSS3 [Apply] CO2. Develop responsive web pages using CSS, JavaScript and bootstrap. [Apply] CO3. Demonstrate the concepts of Angular.js to develop a web front-end. [Apply] CO4. Illustrate the concepts of React.js to develop a web front-end. [Apply]					
<b>Course Content:</b>						

### **ist of Laboratory Tasks:**

#### *Experiment No. 1: [4 + 1 Practical Sessions]*

- **Level 1:** Familiarization of HTML and CSS basics.
  - **Level 2:** Create an HTML webpage showcasing biodata with CSS styling.
- 

#### *Experiment No. 2: [4 + 1 Practical Sessions]*

- **Level 1:** Design an interactive web page for a new restaurant using CSS3 features.
  - **Level 2:** Create a simple web form to gather user information.
- 

#### *Experiment No. 3: [5 + 1 Practical Sessions]*

- **Level 1:** Practice basic JavaScript exercises, including creating a canvas drawing application.
  - **Level 2:** Implement JavaScript exercises for form validation.
- 

#### *Experiment No. 4 [5 + 1 Practical Sessions]*

- **Level 1:** Create a student registration form using JavaScript.
  - **Level 2:** Design an RSVP form using Bootstrap form controls.
- 

#### *Experiment No. 5 [4 + 1 Practical Sessions]*

- **Level 1:** Create a responsive image grid using Bootstrap 5.
- **Level 2:** Write a JavaScript program using AJAX to dynamically load content and implement jQuery effects like fading.

#### *Experiment No. 6 [5 + 1 Practical Sessions]*

- **Level 1:** Create an AngularJS application module and controller in app.js.
- **Level 2:** Design an "AngularJS Solar System Explorer" for planet data visualization.

#### *Experiment No. 7 [5 + 1 Practical Sessions]*

- **Level 1 :** Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event
- **Level 2:** Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.

**Targeted Application & Tools that can be used:**

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: Replit

**Project work/Assignment:**

1. **Problem Solving: Design of Algorithms and implementation of programs.**
2. **Programming: Implementation of given scenario using Java.**

**Text Book:**

- T1. Fender, Young, “*Front-end Fundamentals*”,Leanpub, 2015
- T2. Northwood, Chris, “*The Front End Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer*”,APress, 2018

**References:**

- R1. Flanagan D S, “*Javascript : The Definitive Guide*” 7th Edition. 7th ed. O'Reilly Media; 2020.
- R2. Alex Libby, Gaurav Gupta, and AsojTalesra. “*Responsive Web Design with HTML5 and CSS3 Essentials*”,Packt Publishing, 2016
- R3. Duckett J Ruppert G Moore J. “*Javascript&Jquery : Interactive Front-End Web Development.*”; Wiley; 2014.
- R4. Greg Sidelnikov, “*React.js Book\_ Learning React JavaScript Library*”, 1 edition, Scratch-River Tigris LLC 2016
- R5. Web Reference:  
[https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo\\_jx1Y\\_uTWA&index=2](https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jx1Y_uTWA&index=2)

**CSA2113      Web Application Development**

<b>Course Code:</b> CSAXXX	<b>Course Title: Web Application Development</b> <b>Type of Course:1] School Core</b> <b>2] Laboratory integrated</b>	<b>L-P-</b> <b>C</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>
<b>Version No.</b>	2.0					
<b>Course Pre-requisites</b>	NIL					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	<p>This course is designed to build the student’s knowledge on web design and development to an intermediate level. Students will learn the fundamental languages and markups for front-end web programming and back end languages. By the end of this course, students should be able to design, program and publish a working and atheistic website. Students will also go through the process of working in a client/server side programming and learning skills which is necessary to successfully fulfill each role.</p> <p>The associated laboratory provides a platform to implement the various programming language to design web pages and enhance critical thinking and analytical skills.</p>					
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>Web Application</b> and attain <b>Skill Development</b> through <b>Participative Learning</b> techniques.					
<b>Course Out Comes</b>	<p>On successful completion of this course the students shall be able to:</p> <ol style="list-style-type: none"> <li>1) Understand and briefly explained the semantics and syntax of HTML and CSS. [ Application]</li> <li>2) Design and develop client side scripts and web pages using HTML, CSS and Java script.[Application]</li> <li>3) Understand PHP language and use them while applying the principles of object oriented development .[Application]</li> </ol>					
<b>Course Content:</b>						
<b>List of Laboratory Tasks:</b>						
<b>Lab sheet -1 [ 4 Practical Sessions]</b>						
<b>Experiment No 1:</b>						
<b>Level 1</b> –Design a simple web page with head, body and footer, with heading tags, image tag.						
<b>Level 2</b> - Design a page to display the product information such as name, brand, price and etc with table tag.						
<b>Experiment No. 2:</b>						
<b>Level 1</b> –Design a web site for book information, home page should contain books list, when particular book is clicked, information of the books should display in the next page.						
<b>Level 2</b> - Design a web page to capture the user information such as name, gender, mobile number, mail id, city, state, and country using form elements.						
<b>Lab sheet – 2 [4 Practical Sessions]</b>						
<b>Experiment No. 1:</b>						
<b>Level 1</b> - Design a web page with nice formatting like background image, text colors and border for text using external CSS.						
<b>Level 2</b> -JavaScript to perform mathematical calculations such as addition, subtraction, multiplication, and division using form elements						
<b>Experiment No. 2:</b>						

**Level 1-** Design a web page to display timer in the left side of the web page using Java Script.

**Level 2-** Design a web page to capture the student details such as student number, name, age, marks using Java Script Object.

**Lab sheet – 3 [ 5 Practical Sessions]**

**Experiment No. 1:**

**Level 1 -** JavaScript that calculates the Squares and Cubes of numbers from 0 to 10.

**Level 2 –**Display the results in an HTML table format.

**Experiment No. 2:**

**Level 1 -**JavaScript code that displays text “PRESIDENCY-UNIVERSITY” with increasing font size in the interval of 200ms in a color.

**Level 2 –**When font reaches to 100pt it displays “School of Engineering” in a color. Then font size decreases to 10pt.

**Lab sheet – 4 [ 5 Practical Sessions]**

**Experiment No. 1:**

**Level 1 -** PHP program to find the sum of digits.

**Level 2 -**PHP program to print a table of a number.

**Experiment No. 2:**

**Level 1 -** PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

**Level 2 -**PHP program to display a digital clock which display the current time of the server.

**Lab sheet -5 [6 Practical Sessions]**

**Experiment No. 1:**

**Level 1 -** PHP program to sort the student’s records which are stored in the database using the SELECTION sort.

**Level 2 –**Design an XML document to store information about a student in a college. The information must include USN, Name, Course name, Year of joining, and email id. Create a style sheet and use it to display document.

**Lab sheet -6 [6 Practical Sessions]**

**Experiment No. 1:**

**Level 1 -** Write the PHP code to validate phone number. An message should pop up with incorrect phone number is uploaded.

**Level 2 –** Write a pattern that matches e-mail addresses.

The personal information part contains the following ASCII characters.

Uppercase (A-Z) and lowercase (a-z) English letters.

Digits (0-9).

Characters ! # \$ % & ' \* + - / = ? ^ \_ ` { | } ~

Character .( period, dot or fullstop) provided that it is not the first or last character and it will not come one after the other.

**Lab sheet -7 [6 Practical Sessions]**

**Level 1 -** Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

**Level 2 -** Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

**Lab sheet -8 [6 Practical Sessions]**

**Level 1 -** Write a PHP program named states.py that declares variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:

- a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.

Search for a word in states that begins with k and ends in s. Perform a caseinsensitive comparison. [Note: Passing re.I as a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList.

- c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
- d. Search for a word in states that ends in a. Store this word in element 3 of the list.

**Level 2** - Write a PHP program to sort the student records which are stored in the database using selection sort.

**Targeted Application & Tools that can be used: NA**

**Project work/Assignment: Mention the Type of Project /Assignment proposed for this course**

Write html & CSS code for the following:

- 6] Create a webpage by title: urnamebabyshop (eg., SKGbabyshop) file name should be yourname\_rollnumber.html.
- 7] Put a fixed repeat x background image with radial gradient effect for a paragraph with data telling why the user should shop in your webpage.
- 8] Using box model write the shop name with shadow effects next to a small logo.

Text Book

1. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, 9th Edition, 2016.
2. Paul Deitel, Harvey Deitel, Abbey Deital, "Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.
3. CSS Notes for Professionals, ebook available at <https://books.goalkicker.com/CSSBook/> (Retrieved on Jan. 20, 2022)
4. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

**References**

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st. Edition, 2016.
2. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 1st Edition, 2016.

## CSA2002 AI in Finance and Business Accounting

<b>Course Code:</b> CSA2002	<b>Course Title:</b> AI in Finance and Business Accounting		<b>L-T-P-C</b>	0	0	6	3
	<b>Type of Course:</b> Practical Lab						
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	Nil						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	This course provides a hands-on introduction to the application of Artificial Intelligence (AI) in finance and business accounting. Through lab-based sessions, students will explore how AI technologies, such as machine learning, natural language processing, and predictive analytics, are used in financial decision-making, risk management, and accounting processes. The course emphasizes practical skills, with students working on real-world financial datasets, building AI models, and using AI tools for tasks such as fraud detection, financial forecasting, and automated accounting. Ethical considerations and challenges in AI-driven finance are also discussed.						
<b>Course Objective</b>	The objective of this course is to equip students with practical skills in applying AI techniques to finance and accounting. By the end of the course, students will be able to use AI tools for financial analysis, build predictive models, and understand the ethical implications of AI in these domains.						
<b>Course Out Comes</b>	<b>CO1:</b> Demonstrate the use of AI tools for financial data analysis. [Apply] <b>CO2:</b> Develop AI models for financial forecasting and risk assessment. [Create] <b>CO3:</b> Implement AI techniques for fraud detection and automated accounting. [Apply] <b>CO4:</b> Evaluate ethical challenges in AI-driven finance and accounting. [Evaluate]						
<b>Course Content:</b>							
<b>Module 1</b>	<b>Introduction to AI in Finance and Accounting</b>	<b>Assignments</b>	<b>Quizzes</b>	<b>8 Sessions</b>			
Overview of AI technologies, Applications of AI in finance and accounting, Ethical considerations in AI, Case studies of AI in financial decision-making.							
<b>Module 2</b>	<b>AI Techniques for Financial Modeling</b>	<b>Quizzes and Assignments</b>	<b>Comprehension-based Quizzes</b>	<b>8 Sessions</b>			
Machine learning for financial forecasting, Predictive analytics, Time-series analysis, AI-driven financial modeling tools.							
<b>Module 3</b>	<b>AI in Fraud Detection and Risk Management</b>	<b>Term Paper/Assignment</b>	<b>Quizzes</b>	<b>8 Sessions</b>			
Fraud detection using AI, Risk assessment models, Anomaly detection, AI in regulatory compliance.							

<b>Module 4</b>	<b>Automated Accounting Systems</b>	<b>Term Paper/Assignment</b>	<b>Classification on AI Tools</b>	<b>10 Sessions</b>
AI in bookkeeping, Automated invoice processing, AI-driven auditing, Blockchain and AI in accounting.				
<b>Module 5</b>	<b>Ethics and Challenges in AI-Driven Finance</b>	<b>Term Paper/Assignment</b>	<b>Case Studies</b>	<b>9 Sessions</b>
Ethical implications of AI in finance, Bias in AI models, Transparency and accountability, Future trends in AI and finance.				
<p><b>List of Laboratory Tasks:</b>  Each lab sheet will include experiments and hands-on activities related to AI tools and techniques used in finance and accounting. Lab tasks will be prepared based on Level 0 and Level 1 module-wise.</p> <p><b>Lab 1: Introduction to AI Tools and Financial Datasets</b>  <b>Scenario:</b>  You are given a dataset of monthly sales for a small retail store. Using Python and Pandas, load the dataset, display the first 10 rows, and create a simple line graph to visualize the sales trend over time.</p> <p><b>Lab 2: Data Cleaning for Financial Data</b>  <b>Scenario:</b>  A dataset of customer transactions has missing values and some incorrect entries (e.g., negative amounts). Use Python to clean the dataset by filling missing values with the average and removing rows with negative amounts.</p> <p><b>Lab 3: Simple Financial Forecasting</b>  <b>Scenario:</b>  Using a dataset of monthly electricity bills, predict the bill for the next month using a simple linear regression model in Python. Plot the actual vs. predicted values to see how well the model performs.</p> <p><b>Lab 4: Stock Price Prediction (Basic)</b>  <b>Scenario:</b>  You are given a dataset of daily closing prices for a stock. Use Python to calculate the average price over the last 7 days and predict the next day's price using this average.</p> <p><b>Lab 5: Fraud Detection (Basic)</b>  <b>Scenario:</b>  A dataset of credit card transactions includes a column labeled "fraud" (1 for fraud, 0 for normal). Use Python to count how many transactions are fraudulent and create a bar chart to show the comparison between fraudulent and normal transactions.</p> <p><b>Lab 6: Risk Assessment (Basic)</b>  <b>Scenario:</b>  A dataset of loan applicants includes columns like age, income, and loan amount. Use Python to calculate the average income of applicants and identify applicants with income below the average as "high risk."</p> <p><b>Lab 7: Automated Invoice Processing (Basic)</b></p>				



**Scenario:**

You are given a CSV file containing invoice data (invoice number, date, amount). Use Python to filter invoices with amounts greater than \$1000 and save them to a new CSV file.

**Lab 8: AI-Driven Auditing (Basic)****Scenario:**

A dataset of financial transactions includes a column for "amount." Use Python to identify transactions where the amount is unusually high (e.g., more than 3 times the average) and flag them for review.

**Lab 9: Blockchain Simulation (Basic)****Scenario:**

Simulate a simple blockchain for recording transactions. Use Python to create a list of transactions (e.g., "Alice pays Bob \$50") and display the list as a "blockchain."

**Lab 10: Ethical Implications of AI (Basic)****Scenario:**

A dataset of loan applicants includes a column for gender. Use Python to count how many male and female applicants are in the dataset and discuss whether the dataset is balanced or biased.

**Lab 11: Portfolio Optimization (Basic)****Scenario:**

You are given a dataset of monthly returns for two stocks. Use Python to calculate the average return for each stock and suggest which stock is better for investment based on the higher average return.

**Lab 12: Final Project – Simple AI-Driven Financial System****Scenario:**

Combine the skills learned in previous labs to create a simple financial system. For example:

- Load a dataset of sales data.
- Clean the data by removing missing values.
- Predict next month's sales using a simple average.
- Identify unusually high sales for review.
- Save the results in a new file.

**Targeted Application & Tools that can be used:**

- Python, TensorFlow, Scikit-learn, Tableau, and other AI/ML tools for financial analysis.
- Accounting software integrated with AI (e.g., QuickBooks, Xero).

**Assignment:****1. Assignments:**

1. Assignments will be given after the completion of each module, which students must submit within the stipulated deadline.
2. Term papers or case studies will be assigned to evaluate students' understanding of AI applications in finance and accounting.

**Text Book**

1. "Artificial Intelligence in Finance: A Python-Based Guide" by Yves Hilpisch, O'Reilly Media, 2020.
2. "AI for Finance and Accounting" by David Kuo Chuen Lee, Wiley, 2021.

### References

1. **"Machine Learning for Asset Managers"** by Marcos López de Prado, Cambridge University Press, 2020.
2. **"AI in Accounting: Practical Applications"** by Robotic Process Automation (RPA) and AI in Accounting, Springer, 2022.
3. **"Ethics of Artificial Intelligence in Finance"** by David Leslie, Springer, 2021.

### Topics relevant to "SKILL DEVELOPMENT":

- **AI Techniques for Financial Modeling and Ethics in AI-Driven Finance for Skill Development through Participative Learning** techniques. This is attained through the assessment components mentioned in the course handout.

### CSA XXXX Pattern Recognition

<b>Course Code:</b> CSAXXXX	<b>Course Title:</b> Pattern Recognition <b>Type of Course:</b> Program Lab	<b>L-T-P-C</b>	0	0	6	3
<b>Version No.</b>	2.0					
<b>Course Pre-requisites</b>	<ul style="list-style-type: none"> <li>• Basic knowledge of mathematics (linear algebra, probability, and statistics).</li> <li>• Understanding of data structures and algorithms.</li> <li>• Familiarity with programming languages like Python, MATLAB, or C++.</li> <li>• Basic concepts of machine learning and image processing (preferred but not mandatory).</li> <li>•</li> </ul>					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This course introduces the fundamental concepts of pattern recognition, including feature extraction, classification, clustering, and machine learning techniques. Students will explore various algorithms used in image processing, speech recognition, and biometric authentication. The course provides hands-on experience in developing pattern recognition models using real-world datasets.					
<b>Course Objective</b>	<p>This course aims to equip BCA students with foundational knowledge and practical skills by providing hands-on experience in implementing pattern recognition techniques using programming languages like Python or MATLAB, To develop practical skills in feature extraction, classification, and clustering using real-world datasets, To train students in applying machine learning algorithms for recognizing patterns in images, text, and speech, To enhance problem-solving abilities by working on mini-projects and case studies in biometric authentication, handwriting recognition, and object detection.</p> <p>To enable students to evaluate model performance using metrics like accuracy, precision, recall, and F1-score.</p>					
<b>Course Out Comes</b>	<p>Upon successful completion of this course, students will be able to:</p> <p>CO1: To understand the fundamentals of pattern recognition and its applications.</p> <p>CO2: To learn different classification and clustering techniques.</p> <p>CO3: To develop skills in feature extraction and dimensionality reduction.</p> <p>CO4: To implement machine learning algorithms for pattern recognition.</p>					
<b>Course Content:</b>						
<b>Module 1</b>	<b>Introduction to Pattern Recognition</b>	Quiz/Short Test	Quizzes form basics of pattern recognition			<b>18 Sessions</b>

Definition and Scope of Pattern Recognition, Applications in Image Processing, Speech Recognition, and Biometrics, Statistical vs. Syntactic Pattern Recognition, Supervised, Unsupervised, and Semi-supervised Learning.				
<b>Module 2</b>	<b>Feature Extraction and Selection</b>	Practical Assignment	Viva and Lab exam	<b>18 Sessions</b>
Feature Types: Numeric, Categorical, and Text-based Features, Feature Engineering Techniques, Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Feature Normalization and Selection. Methods				
<b>Module 3</b>	<b>Classification and Clustering Techniques</b>	Case Study & Report	Comprehension based Quizzes and Practical Examination	<b>18 Sessions</b>
C Bayesian Decision Theory, k-Nearest Neighbors (k-NN), Support Vector Machines (SVM) , Neural Networks and Deep Learning for Classification , Clustering Algorithms: k-Means, Hierarchical, DBSCAN				
<b>Module 4</b>	<b>Advanced Topics and Applications</b>	Final Project & Presentation	Lab exam/ Demo	<b>18 Sessions</b>
Hidden Markov Models (HMM) and Gaussian Mixture Models (GMM) , Deep Learning for Pattern Recognition (CNN, RNN) , Real-World Case Studies in Biometric Authentication and Object Detection Ethical Considerations in Pattern Recognition.				
<b>Module 5</b>	<b>Advanced Pattern Recognition Techniques</b>	Final Project & Presentation	Lab exam/ Demo	<b>18 Sessions</b>
Neural Networks for pattern recognition (introduction to deep learning) , Introduction to Convolutional Neural Networks (CNNs) for image recognition , Application of pattern recognition in real-world problems (e.g., handwriting recognition) , Hands-on: Implement a simple neural network and apply it to an image recognition task				
<p><b>List of Laboratory Tasks:</b></p> <p>This lab syllabus provides hands-on experience to develop hands-on skills in implementing feature extraction, classification, and clustering using Python/MATLAB, Gain practical experience in data preprocessing, machine learning model building, and performance evaluation for pattern recognition applications.:</p> <p><b>Experiment 1: Assuming a set of images that need to be classified, read the images and calculate basic statistics such as mean, mode, standard deviation, etc.,</b></p> <p><b>Experiment 2: Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.</b></p>				

**Experiment 3: Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients.**

**Experiment 4: Introduction and Setup of Cassandra**

**Experiment 5 Write a program to perform Data Analysis on a given Dataset.**

**Experiment 6: Write a program to implement KNN on an image dataset.**

**Experiment 7: Write a program to implement K-Means Clustering.**

**Experiment 8: Write a program to implement PCA (Principle Component Analysis).**

**Experiment 9: Final Project**

These experiments help BCA students to acquire proficiency in implementing pattern recognition techniques, including feature extraction, classification, and clustering and to develop practical skills in machine learning model evaluation, data preprocessing, and real-world problem-solving using programming tools.

**Targeted Application & Tools that can be used: NA**

**Assignment:**

**1.** Assignments in pattern recognition for the students are provided at the end of each module and must be submitted by students within the specified deadline.

**Text Book**

5. "Pattern Recognition and Machine Learning" – Christopher M. Bishop
6. "Pattern Classification" – Richard O. Duda, Peter E. Hart, David G. Stork.

**References**

1. "Machine Learning" – Tom M. Mitchell
2. "Introduction to Statistical Learning" – Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
3. "Neural Networks and Deep Learning" – Charu C. Aggarwal.

**Topics relevant to "SKILL DEVELOPMENT":**

- Programming for Pattern Recognition: Implementing algorithms using Python and MATLAB.
- Data Preprocessing and Feature Engineering: Handling real-world datasets for classification.
- Model Evaluation and Optimization: Performance metrics, confusion matrix, and hyperparameter tuning.
- Hands-on Projects: Image recognition, speech recognition, and biometric systems.

## CSA2118 Security aspects of ML

Course Code: CSA2118	Course Title: Security aspects of ML	L-T-P- C	3	0	0	3
	Type of Course: Theory & Integrated Laboratory					
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	Machine Learning (ML) systems are increasingly vulnerable to security threats such as adversarial attacks, data poisoning, model inversion, and privacy breaches. This course explores the critical security aspects of ML, covering attack vectors, defense mechanisms, and secure ML deployment strategies.					
Course Objective	On successful completion of the course the students shall be able to familiarize the learners with the concepts of Security aspects of ML and attain Skill Development through Participative Learning techniques.					
Course Out Comes	<p>On successful completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Analyze</b> security threats in ML systems by examining adversarial attacks, data poisoning, and privacy vulnerabilities.</li> <li><input type="checkbox"/> <b>Apply</b> defense mechanisms such as adversarial training, differential privacy, and federated learning to enhance model security.</li> <li><input type="checkbox"/> <b>Evaluate</b> the robustness and privacy of ML models by conducting security assessments and risk analysis.</li> <li><input type="checkbox"/> <b>Design</b> secure ML applications by integrating best practices for model protection, ensuring integrity, confidentiality, and reliability.</li> </ul>					
Course Content:						
Module 1	Introduction to ML Security	Assignments	Ethical and legal considerations in ML	11 Sessions		
Overview of ML security challenges, Types of threats: Adversarial attacks, data poisoning, model inversion, and membership inference, Case studies of ML security breaches, Ethical and legal considerations in ML security						
Module 2	Adversarial Attacks and Defenses	Assignments	Case studies on privacy-preserving AI applications	11 Sessions		
Privacy risks in ML: Model inversion, data leakage, and membership inference attacks, Techniques for privacy preservation: Differential privacy, federated learning, homomorphic encryption, Secure multi-party computation in ML, Case studies on privacy-preserving AI applications						
Module 3	Privacy-Preserving Machine Learning	Quiz	RNN	12 Sessions		
Recurrent Nets: Unfolding computational graphs, recurrent neural networks (RNNs), bidirectional RNNs, encoder-decoder sequence to sequence architectures, deep recurrent networks, LSTM networks.						
Module 4	Secure Deployment and Risk Management	Project	Real time Scenario	11 Sessions		
Security best practices in ML model deployment, Threat modeling and risk assessment for ML pipelines Secure model monitoring and patching vulnerabilities, Regulatory compliance and governance in secure AI systems						
Assignment:						

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

**Text Book**

T1. Hu, H., & Hei, X. (2023). *AI, Machine Learning and Deep Learning: A Security Perspective*. CRC Press.

T2. Coeckelbergh, M. (2020). *AI Ethics*. The MIT Press.

**References**

R1. Stamp, M. (2022). *Introduction to Machine Learning with Applications in Information Security* (2nd ed.). CRC Press.

R2. Crawford, K. (2021). *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. Yale University Press.

**Topics relevant to the development of Employability:**

Threat modeling and risk assessment for ML pipelines

### CSAXXXX - Predictive Analytics

Course Code: CSAXXXX	Course Title: Predictive Analytics Type of Course: Discipline Elective	L-T- P-C	0	0	6	3
Version No.	1.0					
Course Pre-requisites	Basic Communication General Knowledge about Descriptive Analytics					
Anti-requisites	NIL					
Course Description	Predictive Analytics subject is conceptual in nature. The students will be benefited in this course to know about modern data analytic concepts and develop the skills for analysing and synthesizing data sets for decision making in the firms.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Predictive Analytics and attain <b>Employability Skills</b> through <b>Experiential Learning</b> techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO 1: Define the nature of analytics and its applications (Knowledge) CO 2: Discuss the concepts of predictive analytics and data mining (Comprehension) CO 3: Compute the analytical tools in business scenarios to achieve competitive advantage (Application) CO 4: Relate the real-world insights in decision trees and time series analysis methods in dynamic business environment (Application) CO 5: Outline the importance of big data in predictive analytics (Comprehension)					
Course Content:						
Module 1	Introduction to Predictive Analytics	Self-Learning	Applications of analytics			12 Sessions
Topics: Analytics- Definition, importance, Analytics in decision making, Applications, Challenges, Experts perception on analytics; Popularity in Analytics; Predictive analytics in business Scenarios- case studies						
Module 2	Predictive Analytics & Data Mining	Case analysis	Predictive Analytics – Employee Attrition Case center.CO2. <a href="https://www.thecasecentre.org/products/view?id=143229">https://www.thecasecentre.org/products/view?id=143229</a>			12 Sessions
Topics: Predictive Analytics- Definition, Importance and application; Predictive Analytics – Marketing, Health care & other industries; Skills and roles in Predictive Analytics; Tools & Software; Data Mining – Page 2 of 4 Definition, applications, kinds of pattern data mining can discover, data mining tools & dark side of data mining						
Module 3	Data, Methods & Algorithms for Predictive Analytics	Participative Learning & Case Analysis	Predictive analytics in HR			14 Sessions
Topics: Nature; Pre-processing of data for analytics; Data Mining methods; Prediction; Classification- Decision trees; Cluster analysis, K means clustering, Association; Predictive analytics misconception; Algorithms - Naïve Bays, nearest neighbour; Regression - Simple linear						



regression (SLR) using OLS method, Multiple linear regression (MLR); Violation of Ordinary least squares (OLS) method - Auto correlation, Heteroscedasticity , multicollinearity				
Module 4	Business Forecasting & Decisions Trees	Discussion & Presentation	Business Forecasting	10 Sessions
Topics Module 4: Business Forecasting; Time Series Data and Time Series Analysis- based Forecasting, Forecasting Accuracy, Auto-regressive and Moving average model; Decision Trees : Introduction to decision trees; Analysis – unstructured data				
Module 5	Big Data in Predictive Analytics	Discussion & Presentation	Darkside of data mining, Challenges and problems in data analytics	06 Sessions
Fundamental concepts of Big data; Challenges and problems in data analytics; Big data technologies; Big data & stream analytics; Expert views on analytics; Simulation – A/B Testing Data preparation, cleaning, and exploratory analysis using data visualization and descriptive statistics; applications of multiple regression for numeric prediction				
List of Laboratory Tasks:				
1.Predicting buying behavior analytics to identify buying habits based on previous purchase history. predict customer purchase patterns.				
2.Fraud detection To identify anomalies in the system and detect unusual behavior to determine threats. experts can feed historical data of cyberattacks and threats to the system. When the predictive analytics algorithm identifies something similar, it will send a notification to the respective personnel.				
3.Healthcare diagnosis understanding the disease by providing an accurate diagnosis based on past data. predictive analytics help doctors reach the root cause of diseases.				
4.Card abandonment predict how likely a customer is to abandon the cart. It will also provide companies with details about each customer about whether they will purchase or abandon the cart based on the previous visits to the store.				
5.Content recommendation entertainment companies can predict what users want to watch based on their history. use analytics for predicting the user’s behavior.				
6. Equipment maintenance the machinery would alert the personnel and the maintenance can be done to avoid unscheduled and accidental breakdowns.				
Targeted Application & Tools that can be used Statistical tools, documentary review, case analysis and Simulation help students to understand the data driven decisions for firms				
Project work/Assignment:				
Project: By developing the questionnaire for specific objective of the brands, primary data collection and do the sales forecasting by using predictive analysis using SPSS software and develop report on data storytelling from the data analysis.				
Assignment:				

1. Review the article on Organisational capabilities in PA using PU link <https://www.emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/MD-03-2018-0324/full/html>
2. Develop a podcast of 5 mins of each group discussions on Darkside of data mining. Each group consist of 5 members in the team

#### Text Book

T1 : Predictive Analytics Delen, D. (2020). Predictive Analytics: Data Mining, Machine Learning and Data Science for Practitioners. Upper Saddle River, NJ, USA: FT Press. (Pearson Publication)

#### References

- R1 Dinesh Kumar, U. (2021). Business Analytics: The Science of data-Driven Decision Making.
- R2 Business Analytics - Data Analysis & Decision Making”, S. Christian Albright and Wayne L. Winston, Cengage Publication, 5th Edition, 2012
- E book link R1: Raman, R., Bhattacharya, S., & Pramod, D. (2018). Predict employee attrition by using predictive analytics. Benchmarking: An International Journal. <https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/BIJ-03-2018-0083/full/html>
2. E book link R2: Jing, Z., Luo, Y., Li, X., & Xu, X. (2022). A multi-dimensional city data embedding model for improving predictive analytics and urban operations. Industrial Management & Data Systems, (ahead-of-print). <https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/IMDS-01-2022-0020/full/html>
3. E book link R3: Singh, R., Sharma, P., Foropon, C., & Belal, H. M. (2022). The role of big data and predictive analytics in the employee retention: a resource-based view. International Journal of Manpower. <https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/IJM-03-2021-0197/full/html>
4. E book link R4: Mishra, D., Luo, Z., Hazen, B., Hassini, E., & Foropon, C. (2018). Organizational capabilities that enable big data and predictive analytics diffusion and organizational performance: A resource-based perspective. Management Decision. <https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/MD-03-2018-0324/full/html>

#### Web resources:

- W1. [https://www.sas.com/en\\_in/insights/analytics/predictive-analytics.html](https://www.sas.com/en_in/insights/analytics/predictive-analytics.html)
- W2. <https://www.techtarget.com/searchbusinessanalytics/definition/predictive-analytics>
- W3. <https://www.cio.com/article/228901/what-is-predictive-analytics-transforming-data-into-future-insights.html>
- W4. <https://www.simplilearn.com/what-is-predictive-analytics-article>
- W5. <https://www.northeastern.edu/graduate/blog/predictive-analytics/>
- W6. <https://www.marketingevolution.com/knowledge-center/the-role-of-predictive-analytics-in-data-driven-marketing>
- Swayam & NPTEL Video Lecture Sessions on Predictive Analytics
1. [https://onlinecourses.swayam2.ac.in/imb20\\_mg19/preview](https://onlinecourses.swayam2.ac.in/imb20_mg19/preview)
  2. [https://onlinecourses.nptel.ac.in/noc19\\_mg42/preview](https://onlinecourses.nptel.ac.in/noc19_mg42/preview)

#### Case References

- Predictive Analytics Industry Use cases.  
<https://www.rapidinsight.com/blog/11-examples-of-predictive-analytics/>
- Srinivasan Maheswaran (2017). Predictive Analytics – Employee Attrition Case center. in <https://presiuniv.knimbus.com/user#/home>

Topics relevant to “EMPLOYABILITY SKILLS”: Predictive Analytics”: Application of Business Analytics to enhances customer satisfaction and firms’ success for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

## CSA3070 : Time Series Analysis

<b>Course Code:</b> CSA3070	<b>Course Title:</b> Time Series Analysis <b>Type of Course:</b> Discipline Elective	L- T- P- C	3	0	0	3
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	R, Calculus, Linear Algebra, Probability and Statistics					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	The course will provide a basic introduction to time series analysis. This theory based course covers topics in time series analysis and some statistical techniques on forecasting. Time series regression, exploratory data analysis, AR models, Seasonal Models, GARCH Models and Box-Jenkins approach are the major topics covering in this course. R and RStudio will be required for this class.					
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>Time Series Analysis</b> attain <b>Employability</b> through <b>Experiential Learning</b> techniques					
<b>Course Outcomes</b>	On successful completion of the course the students shall be able to CO1. Select appropriate model, to fit parameter values and make concise decisions based on forecasts obtained CO2. Demonstrate an understanding of the principles behind modern forecasting techniques. CO3. Apply concepts to real time series data using packages.					
<b>Course Content:</b>						
<b>Module 1</b>	Introduction	Assignment	Data Analysis task	<b>9 Sessions</b>		
<b>Topics:</b> Examples of Time Series, Objectives of Time Series Analysis, Characteristics of Time Series, Approaches used for time series forecasting, ETS (Error, Trend, Seasonality) models to make forecasts, Decomposition method, Irregularity concept in decomposition method, Case study on decomposition method, Model forecast theory, Model forecast hands-on, stochastic process.						
<b>Module 2</b>	Time Series Regression and Exploratory Data Analysis	Assignment	Data analysis	<b>10 Sessions</b>		
<b>Topics:</b> Classical Regression in the Time Series Context, Exploratory Data Analysis, Stationary Models and the Autocorrelation Function, Detrending and De-seasonalizing Smoothing, Fundamental Statistical Concepts, Introduction to Time Series Analysis with R,						
<b>Module 3</b>	AR models	Assignment	Data analysis	<b>10 Sessions</b>		
<b>Topics:</b> Models for Stationary Time Series, Models for Non-Stationary Time Series, Identification, Forecasting, ARIMA (Autoregressive, Integrated, Moving Average) models, ARMA models.						

<b>Module 4</b>	Additional models, Spectral Analysis and packages	Case Study	Data analysis	<b>10 Sessions</b>
<b>Topics:</b> Seasonal Models, Time Series Regression Models, GARCH Models, Box-Jenkins approach, Introduction to Spectral Analysis, Estimating the Spectrum, Preparing model using ITSM, Time series using astsa, ARIMA models is to use sarima from astsa				
<b>Targeted Application &amp; Tools that can be used:</b> <b>Targeted Applications:</b> Time series analysis on economics, finance, natural sciences, health care and more <b>Tools:</b> <ul style="list-style-type: none"> <li>• R package astsa (Applied Statistical Time Series Analysis)</li> <li>• The package ITSM2000 ( <a href="https://extras.springer.com/">https://extras.springer.com/</a> )</li> </ul>				
<b>Project work/Assignment:</b>				
<b>Mini Project:</b> <b>Choose any suitable real time dataset and build time series forecast models.</b> <b>Example:</b> In the Air Passengers dataset set, go back 12 months in time and build the ARIMA forecast for the next 12 month. Investigate following questions <ul style="list-style-type: none"> <li>Is the series stationary? If not what sort of differencing is required?</li> <li>What is the order of your best model?</li> <li>What is the AIC of your model?</li> <li>What is the order of the best model predicted by auto_arima() method?</li> </ul> <b>Term Assignments:</b> Understand and implement ARMA and ARIMA models in Python/R for time series forecasting				
<b>Text Book</b> T1. Montgomery DC, Jennings CL, Kulahei M. Introduction to time series analysis and forecasting. John Wiley & Sons; 2015 Apr 21. T2. Brockwell & Davis (2016) Introduction to Time Series and Forecasting, 3rd edition, Springer. T3. Shumway & Stoffer (2011) Time Series Analysis and its applications, with examples in R , 3rd edition, Springer.				
<b>References</b> R1. Box GE, Jenkins GM, Reinsel GC, Ljung GM (2015) Time series analysis: forecasting and control. John Wiley & Sons R2. Cryer & Chan (2008) Time Series Analysis with Applications in R, Springer R3. Prado & West (2010) Time Series: Modeling, Computation, and Inference Chapman & Hall				
<b>Weblinks</b> W1. <a href="https://www.coursera.org/courses?query=time%20series%20analysis">https://www.coursera.org/courses?query=time%20series%20analysis</a> W2. <a href="https://www.tableau.com/learn/articles/time-series-forecasting">https://www.tableau.com/learn/articles/time-series-forecasting</a> W3. <a href="https://presiuniv.knimbus.com/user#/home">https://presiuniv.knimbus.com/user#/home</a>				
<b>Topics relevant to “EMPLOYABILITY DEVELOPMENT”:</b> GARCH Models, Box-Jenkins approach, Introduction to Spectral Analysis, Estimating the Spectrum, <b>for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in the course handout.</b>				

**MAT1008- Probability and Inferential Statistics**

<b>Course Code:</b> MAT1008	<b>Course Title:</b> Probability and Inferential Statistics	<b>LTP</b>	3	0	0	3
	<b>Type of Course:</b> Program Core					
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	MAT1007 – Introduction to Statistics					
<b>Anti-requisites</b>	None					
<b>Course Description</b>	The goal of this course is to provide students with a firm understanding of probability and statistics by means of a thorough treatment of probability, probability distributions, sampling techniques and testing of hypothesis. This course aims at acquainting students with various probability and statistical methods and preparing students for future courses having statistical, quantitative and probabilistic components. On acquiring the necessary knowledge through this course, students will be in a position to identify, interpret, demonstrate and apply probability and statistical tools to a variety of business applications.					
<b>Expected Outcome:</b>	<p>On successful completion of this course, the students will be in a position to</p> <ol style="list-style-type: none"> <li>1. adopt various rules for probability in order to tackle practical problems.</li> <li>2. demonstrate the knowledge of probability and joint probability distributions and their implications.</li> <li>3. interpret the standard probability distributions and their scope.</li> <li>4. employ the ideas of sampling distributions and hypothesis testing systematically.</li> </ol>					
<b>Module 1</b>	<b>Probability</b>					<b>10 classes</b>
Random experiment, sample space, events, probability of an event, addition rule, conditional probability, multiplication law, total probability and Bayes rule.						
<b>Module 2</b>	<b>Random Variables and Probability Distributions</b>					<b>10 classes</b>
Random variables, discrete and continuous probability distributions, probability mass and density functions, joint probability and marginal distributions, mean, variance and covariance of random variables.						
<b>Module 3</b>	<b>Standard Probability Distributions</b>					<b>12 classes</b>
Binomial distribution, geometric distribution, Poisson distribution, continuous uniform distribution, normal and standard normal distributions, exponential distribution.						
<b>Module 4</b>	<b>Sampling Distributions and Tests of Significance</b>					<b>13 classes</b>
Sampling, types of sampling, parameter and statistic, sampling distributions, central limit theorem, tests of significance, null and alternative hypotheses, errors in sampling, critical region and level of significance, one-tailed and two-tailed tests, procedure for testing of hypothesis, large sample test for single and difference of proportions, large sample test for single and difference of means, large sample test for difference of standard deviations, student's t-test for single and difference of means concerning small samples, F-test for equality of population variances concerning small samples, chi-square test of goodness of fit for small samples.						

**Targeted Application & Tools that can be used:**

The objective of the course is to familiarize students with the theoretical concepts of probability and statistics and to equip them with probabilistic and statistical tools to tackle business related and real-life problems.

Tool used: R Software / MS-Excel

**Text Book**

1. R.E. Walpole, R.H. Myers, S.L. Myers and K.E. Ye, Probability and Statistics for Engineers and Scientists, Pearson Education, 2016.

**References**

1. James T. McClave, P. George Benson and Terry Sincich, Statistics for Business and Economics, 2018.
2. D. R. Anderson, D. J. Sweeney, T. A. Williams, Essentials of Modern Business Statistics with Microsoft Excel, 2020.
3. D. R. Anderson, D. J. Sweeney, T. A. Williams, Essentials of Statistics for Business and Economics, 2019.
4. D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, John Wiley and Sons, 2018.
5. Richard A. Johnson, Miller and Freund's Probability and Statistics for Engineers, 2018.
6. Kishor S Trivedi, Probability and Statistics with reliability, Queuing and Computer Science Applications, John Wiley & Sons, 2008.
7. Berenson and Levine, Basic Business Statistics, Prentice- Hall India, 1996.

## CSAXXXX Principles of Cloud Computing

<b>Course Code:</b> CSAXXXX	<b>Course Title: Principles of Cloud Computing</b> <b>Type of Course: Theory</b>	<b>L-P-C</b>	<b>3</b>	<b>0</b>	<b>3</b>
<b>Version No.</b>	1.0				
<b>Course Pre-requisites</b>	<b>Computer Network, grid computing and Java.</b>				
<b>Anti-requisites</b>	NIL				
<b>Course Description</b>	<p>This course aims to introduce the core concepts of cloud computing to gain the foundational knowledge required for understanding cloud computing from a business perspective as also for becoming a cloud practitioner. From the course student will understand the definition and essential characteristics of cloud computing, its history, the business case for cloud computing, and emerging technology use cases enabled by cloud.</p> <p>This course covers on various cloud service models (IaaS, PaaS, SaaS) and deployment models (Public, Private, Hybrid) and the key components of a cloud infrastructure (VMs, Networking, Storage - File, Block, Object).</p>				
<b>Course Outcomes</b>	<p>On successful completion of this course the students shall be able to:</p> <ol style="list-style-type: none"> <li>1. Identify the different cloud services, applications of data in cloud. <b>[Remember]</b></li> <li>2. Apply suitable abstraction, virtualization technique in cloud environment. <b>[Apply]</b></li> <li>3. Discuss different industry platform service, applications for Business and Consumers Services. <b>[Understand]</b></li> <li>4. Managing the infrastructure services, simulator tools in cloud. <b>[Understand]</b></li> </ol>				
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of <b>Essentials of Cloud Computing</b> and attain <b>Skill Development</b> through <b>Participative Learning</b> techniques.				
<b>Course Content:</b>					
<b>Module 1</b>	Introduction to Cloud Computing (Remember)	Assignment			<b>10 Hours</b>
<p>Topics: Cloud computing basics: - Cloud Computing at a Glance – Historical Developments – Building Cloud Computing Environments – Computing Platforms and Technologies- Cloud Reference Model – Types of Clouds – Deployment models of Cloud- Services offered by Cloud- Benefits and Limitations of Cloud Computing.</p>					
<b>Module 2</b>	Virtualization fundamentals (Apply)	Assignment			<b>10 Hours</b>
<p>Topics: Virtualization – Enabling technology for cloud computing- Types of Virtualization- Server Virtualization- Desktop Virtualization – Memory Virtualization – Application and Storage Virtualization- Tools and Products available for Virtualization.</p>					
<b>Module 3</b>	Cloud Platforms in Industry (Understand)	Assignment			<b>10 Hours</b>
<p>Topics: Amazon Web Services – Google AppEngine – Microsoft Azure - Working with mobile devices – Smartphone with the cloud – Mobile web services -Scientific applications– Business and consumer applications.</p>					

<b>Module 4</b>	Cloud Infrastructure (Understand)	Assignment		<b>10 Hours</b>
<p>Topics:  Managing the cloud – Administrating the cloud –Management products –Communicating with the cloud – Instant messaging – Collaboration technologies –Social networks – Media and streaming. Cloud Simulators-Research trends in Cloud Computing- Fog Computing and applications- Cloud Security challenges.</p>				
<p><b>Project work/Assignment: Mention the Type of Project /Assignment proposed for this course</b></p>				
<p>9] Problem Solving: Design and implement dynamic resource allocation for virtual machine using cloud computing environment.</p>				
<p><b>Text Book</b></p> <ol style="list-style-type: none"> <li>1. R. Buyya, C. Vecchiola, S T. Selvi, Mastering Cloud Computing, McGraw Hill (India) Pvt Ltd., 2017</li> <li>2. Barrie Sosinsky, Cloud Computing Bible, Wiley Publishing, Inc.,2011</li> </ol>				
<p><b>References</b></p> <ol style="list-style-type: none"> <li>1. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, “Virtualization, Business Models, Mobile, Security and more, Jones &amp; Bartlett Learning Company, 2013</li> <li>2. Ronald L.Krutz, Russell vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley Publishing Inc., 2010.</li> <li>3. Gautam Shroff, Enterprise Cloud Computing - Technology, Architecture, Applications, Cambridge University Press, 2010</li> <li>4. Singh, S., &amp; Chana, I. Q-aware: Quality of service based cloud resource provisioning. Computers &amp; Electrical Engineering, (2015).</li> </ol>				
<p><b>Online References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://presiuniv.knimbs.com/user#/home">https://presiuniv.knimbs.com/user#/home</a></li> <li>2. <a href="https://blog.storagecraft.com/7-infamous-cloud-security-breaches">https://blog.storagecraft.com/7-infamous-cloud-security-breaches</a></li> <li>3. <a href="https://csrc.nist.gov/publications/detail/sp/800-145/final">https://csrc.nist.gov/publications/detail/sp/800-145/final</a></li> <li>4. <a href="https://threatpost.com/contractor-accesses-2-million-vodafone-germany-customer-records/102286/">https://threatpost.com/contractor-accesses-2-million-vodafone-germany-customer-records/102286/</a></li> <li>5. <a href="https://clutch.co/cloud/resources/security-trends-in-enterprise-cloud-computing">https://clutch.co/cloud/resources/security-trends-in-enterprise-cloud-computing</a></li> </ol>				
<p><b>Online Resources (e-books, notes, ppts, video lectures etc.):</b></p> <ol style="list-style-type: none"> <li>1. NPTEL Course on “Cloud Computing”, <a href="https://onlinecourses.nptel.ac.in/noc21_cs14/preview">https://onlinecourses.nptel.ac.in/noc21_cs14/preview</a></li> <li>2. Udemy Courses on “Cloud Computing”, <a href="https://www.udemy.com/topic/Cloud Computing/">https://www.udemy.com/topic/Cloud Computing/</a></li> </ol>				

### CSAXXXX Enterprise and Cloud Computing

<b>Course Code:</b> CSAXXXX	<b>Course Title: ENTERPRISE AND CLOUD COMPUTING</b>  <b>Type of Course: Core Theory</b>	<b>L- T- P- C</b>	3	0	0	3
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	The prerequisites for this course are Basics of cloud technologies. You are expected to have a working knowledge of include a foundational understanding of several key topics in computer science and Information Technology.					



<b>Anti-requisites</b>	Nil			
<b>Course Description</b>	The main objective of this course is to streamline computing resources, deploy enterprise applications, improve user access and system reliability, and utilize advanced computing capabilities. Foundation concepts include virtualization, multi-tenant architecture, and software defined networking. Examines the full range of services available to organizations along with deployment strategies, evaluation criteria, economic justification, and manageability.			
<b>Course Objectives</b>	The objective of the course is to familiarize the learners with the concepts of <b>ENTERPRISE AND CLOUD COMPUTING</b> and attain <b>Skill Development</b> through <b>Experiential Learning</b> techniques.			
<b>Course Outcomes</b>	<ul style="list-style-type: none"> <li>9. Understand how cloud computing and enterprise applications can advance the mission of an organization and achieve organizational goals</li> <li>10. Identify and describe the variety of mechanisms, technologies, and architectures used in cloud computing systems</li> <li>11. Utilize cloud services, applications, and providers to solve a wide variety of problems and challenges faced by IT managers and organizations</li> <li>12. Justify and adopt cloud technologies, applications, and services and effectively manage their transition into the IT function</li> </ul>			
<b>Course Content:</b>				
<b>Module 1</b>	<b>Introduction to Enterprise Computing</b>	Assignment		<b>8 Sessions</b>
<p>Topics: Introduction to Enterprise Computing</p> <p>Definition and Concepts of Enterprise Systems-Characteristics of enterprise systems,Types of enterprise applications (ERP, CRM, SCM),Enterprise Architecture-Components of enterprise architecture,Enterprise integration,Enterprise Software Development,Software development methodologies (Agile, Waterfall, etc.),Custom vs. packaged enterprise applications</p>				
<b>Module 2</b>	<b>Cloud Computing Fundamentals</b>	Assignment		<b>7 Sessions</b>
<p>Topics: Cloud Computing Fundamentals</p> <p>Cloud Computing Overview,Definition, characteristics, and service models (IaaS, PaaS, SaaS)-Cloud deployment models (Private, Public, Hybrid, Community)-Cloud Computing Technologies-Virtualization, distributed computing-Cloud storage, network, and database-Cloud platforms (AWS, Google Cloud, Microsoft Azure, etc.)-Security concerns and challenges</p>				
<b>Module 3</b>	<b>Enterprise Cloud Integration</b>	Case Study		<b>8 Sessions</b>
<p>Topics: Enterprise Cloud Adoption and Transformation,Cloud strategy, migration challenges,Change management in enterprise cloud adoption,Enterprise Cloud Integration Architectures,Integration of legacy systems with cloud-based solutions,Cloud API s, micro-services, and middleware,Interoperability and Cloud Standards Ensuring compatibility between cloud providers and enterprise systems</p>				

<b>Module 4</b>	<b>Cloud Services Management</b>	Case Study and Project		<b>7 Sessions</b>
<p>Topics:            Cloud Service Life-cycle -Service design, provisioning, monitoring, and decommissioning-Service Level Agreements (SLAs) and Performance-Slaps in cloud environments-Metrics for performance management-. Case Studies and Applications-Real-world Enterprise Cloud Computing Case Studies-Analysis of companies adopting cloud technologies-Success stories and challenges</p>				
<p><b>Targeted Application &amp; Tools that can be used: NA</b></p>				
<p><b>Project work/Assignment:</b></p>				
<p>Assignments are given after completion of each module which the student need to submit within the stipulated deadline.</p>				
<p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.</li> <li>2. George Reese Cloud Application Architectures, First Edition, O'Reilly Media 2009.</li> </ol>				
<p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>15. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum from Pearson 2010.</li> <li>16. Cloud Computing 2nd Edition by Dr. Kumar Saurabh from Wiley India 2012.</li> <li>17. Cloud Computing – web based Applications that change the way you work and collaborate Online – Micheal Miller.Pearson Education.</li> </ol>				
<p><b>Web References</b></p> <ol style="list-style-type: none"> <li>11. <a href="https://nptel.ac.in/Cloud Computing - Course">https://nptel.ac.in/Cloud Computing - Course</a></li> </ol>				

## CSA3069: Data management Using Cloud

<b>Course Code:</b> CSA3069	<b>Course Title:</b> Data management Using Cloud <b>Type of Course:</b> Discipline elective	L- T - P- C	3	0	0	3
<b>Version No.</b>	1.0					
<b>Course Pre-requisites</b>	Basics of Distributed Computing, Service Oriented Architecture					
<b>Anti-requisites</b>	NIL					
<b>Course Description</b>	This Course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. Cloud Computing has emerged in recent years as a new paradigm for hosting and delivering services over the Internet. The students can explore various Cloud Computing terminology, principles and applications. Understanding different views of the Cloud Computing such as theoretical, technical and commercial aspects.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Data management Using <b>Cloud Computing</b> attain <b>Employability</b> through <b>Experiential Learning</b> techniques					
<b>Course Out Comes</b>	<b>On successful completion of the course the students shall be able to:</b> <ol style="list-style-type: none"> <li>1. Describe fundamentals of cloud computing, virtualization and cloud computing services.</li> <li>2. Discuss high-throughput and data-intensive computing.</li> <li>3. Explain security and standards in cloud computing.</li> <li>4. Demonstrate the installation and configuration of virtual machine.</li> </ol>					
<b>Course Content:</b>						
<b>Module 1</b>	<b>Introduction to Cloud and Virtualization</b>	Assignment	Data Collection	<b>10 Sessions</b>		
<b>Topics:</b> Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Computing Platforms and Technologies, Virtualization, Characteristics of Virtualized Environments Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Technology Examples, Cloud Computing Architecture, IaaS, PaaS, SaaS, Types of Clouds, Economics of Cloud.						
<b>Module 2</b>	<b>High Throughput and Data Intensive Computing</b>	Quiz	Problem Solving	<b>10 Sessions</b>		
<b>Topics:</b> Task computing, MPI applications, Task based programming, Introduction to DIC, Technologies for DIC, Aneka Map Reduce Programming.						
<b>Module 3</b>	<b>Cloud Security and Standards</b>	Assignment	Problem Solving	<b>7 Sessions</b>		

**Topics:** Cloud Security Challenges, Software-as-a-Service Security, Application standards, Client standards, Infrastructure and Service standards.

<b>Module 4</b>	<b>Cloud Platforms: Amazon Web Services</b>	Assignment	Problem Solving	<b>9 Sessions</b>
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Communication Services, Additional Services, Google App Engine: Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure: Core Concepts, SQL Azure, Windows Azure Platform Appliance, Observations. Demonstration of VM setup and configuration

**Project work/Assignment:**

**Project Assignment:**

1) Project on domain related cases studies.

Assignment:

- 1] Characteristics and benefits of cloud computing.
- 2] SaaS 2.0 applications.
- 3] Explain high-performance computing, high-throughput computing.
- 4] Explain Windows Azure Platform Appliance.

**Text Book**

**T1** John Rittinghouse and James Ransome, “Cloud Computing, Implementation, Management and Security”, CRC Press.

**T2** Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education.

**References**

**R1** David E.Y. Sarna, “Implementing and Developing Cloud Applications”, CRC Press.

**R2** Anthony T Velte, Toby J Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Tata McGraw-Hill.

**Web resources:** W1. IEEE Transactions on Cloud Computing-  
<https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519>

**Web resources:** W2. International Journal of Cloud Computing-  
<https://www.inderscience.com/jhome.php?jcode=ijcc>

## CSA3027: Cryptography and Network Security

Course Code: CSA3027	Course Title: Cryptography and Network Security. Type of Course: Discipline Elective	L-T- P- C	3	0	0	3
Version No.	1					
Course Pre-requisites	"Data Communications and Computer Networks"					
Anti-requisites	Nil					
Course Description	The Course covers the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cryptography and Network Security. and attain Employability Skill through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Identifies the basic concept of Cryptography (Knowledge) CO2: Express the different types of Cryptographic Algorithms (Comprehension) CO3: Recognize the Public key Cryptographic Techniques for various applications. (Comprehension) CO4: Apply the network security concepts during their implementation of network security application developments. (Application)					
Course Content:						
Module 1	Introduction to Cryptography and types of Ciphers	Assignment	Data Collection/Interpretation	8 Sessions		
Topics: Introduction to Cryptography, Model of Network Security, OSI Security architecture, Security Attacks: active attacks, passive attacks, services: Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Substitution Ciphers : Caesar, Mono alphabetic, Polyalphabetic, Play-fair and Hill Cipher, Introduction to Block Cipher and Stream Cipher, Feistel Structure.						
Module 2	Private Key Cryptography and Number Theory	Case studies / Case let	Case studies / Case let	13 Sessions		
Topics: Symmetric Encryption Algorithms : Data Encryption Standard, Introduction to Galois Field, Advanced Encryption Standard, Modular Arithmetic, Prime numbers, Fermat's little theorem, brief about primality testing and factorization, Discrete Logarithmic Problem, Euclidean and Extended Euclidean Algorithm, Euler Totient Function, Chinese Remainder Theorem.						
Module 3	Public Key Cryptography and its Applications	Quiz	Case studies / Case let	14 Sessions		

Topics: Overview of Public Key Cryptography, RSA, Diffie - Helman Key exchange, Man in the middle attack, Cryptographic Hash functions, Secure Hash Algorithm, Message Authentication Codes – HMAC, Digital Signature, Discussion on real time practices of Cryptography.

Module 4	Network Security	Quiz	Case studies / Case let	14 Sessions
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Topics: Network Security fundamentals, Network Security applications: Authentication: Kerberos, PKI, Network Security applications: e-mail security y: PGP, MIME, Network Security applications: IP Security: IP Sec architecture, Network Security applications: Web Security.

**Targeted Application & Tools that can be used:** Kali Linux

**Project work/Assignment:**

Project: Malware detections, IDS and IPS for IOT devices using wire shark, NMAP etc.

Assignment: Review on types of attacks in networks, Article review, quiz, written assignments

**Text Book**

T1 William Stallings, "*Cryptography and Network Security - Principles and Practices*", Prentice Hall, 8<sup>th</sup> Edition, 2019.

T2. Wade Trappe and Lawrence C Washington, "*Introduction to Cryptography with Coding Theory*", Pearson, 2020.

**References**

R1. Behrouz A Forouzan, Debdeep Mukhopadhyay, "*Cryptography and Network Security*", McGraw Hill, third edition, 2010

R2. R.Rajaram, "*Network Security and Cryptography*" SciTech Publication.3<sup>rd</sup> Edition, 2014

R3. AtulKahate, "*Cryptography and Network Security*", Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2019

R4. BruceSchneier, "*Applied Cryptography*", John Wiley and Sons Inc. Second Edition, 2015.

**E book link T1:** [http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=10133&query\\_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security](http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=10133&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security)

Web resources:

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ>

[https://onlinecourses.nptel.ac.in/noc22\\_cs90/preview](https://onlinecourses.nptel.ac.in/noc22_cs90/preview)

**Topics relevant to “EMPLOYABILITY SKILLS”:** Helman Key exchange, Man in the middle attack, Cryptographic Hash functions, Secure Hash Algorithm for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout..

## CSA3050 Ethical Hacking

<b>Course Code:</b> CSA3050	<b>Course Title:</b> Ethical Hacking <b>Type of Course:</b> Discipline Elective in Cyber Security Basket		<b>L-T-P-C</b>	2	0	2	3
<b>Version No.</b>	1.0						
<b>Course Pre-requisites</b>	basic networking tools knowledge and Cryptography & Network Security						
<b>Anti-requisites</b>	NIL						
<b>Course Description</b>	This course introduces students to a wide range of topics related to ethical hacking. It also provides an in-depth understanding of how to effectively protect computer networks. These topics cover some of the tools and penetration testing methodologies used by ethical hackers and provide a thorough discussion of what and who an ethical hacker is and how important they are in protecting corporate and government data from cyber-attacks						
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of Ethical Hacking attain Employability through Experiential Learning techniques.						
<b>Course Outcomes</b>	On successful completion of this course the students shall be able to: Illustrate the importance of ethical hacking Categorize the various techniques for performing reconnaissance. Demonstrate various types of system scanners and their functions Demonstrate the function of sniffers on a network						
<b>Course Content:</b>							
<b>Module 1</b>	Introduction to Hacking (Knowledge, Application)	Assignment	Programming activity	12 Hours			
<b>Topics:</b> Introduction to Hacking-Important Terminologies - Asset - Vulnerability - Penetration Test - Vulnerability Assessments versus Penetration Test - Penetration Testing Methodologies - Categories of Penetration Test. <b>Assignment:</b> Different phase methodologies on penetration testing							
<b>Module 2</b>	Linux Basics	Assignment	Programming activity	10 Hours			
<b>Topics:</b> Major Linux Operating Systems - File Structure inside of Linux - BackTrack - Changing the Default Screen Resolution - Some Unforgettable Basics. <b>Assignment:</b> Penetration testing distribution							
<b>Module 3</b>	Information Gathering Techniques	Assignment	Programming activity	11 Hours			
<b>Topics:</b> Sources of Information Gathering - Copying Websites Locally - NeoTrace - Xcode Exploit Scanner - Interacting with DNS Servers - DNS Cache Snooping - DNS Lookup with Fierce - SNMP - SMTP. <b>Assignment:</b> Domain internet groper							
<b>Module 4</b>	Target Enumeration and Port Scanning Techniques	Assignment	Programming activity	13 Hours			
<b>Topics:</b> Target Enumeration and Port Scanning Techniques - Host Discovery - Scanning for Open Ports and Services - Types of Port Scanning - Vulnerability Assessment. <b>Assignment:</b> Demonstrations for port scanning							
<b>List of Laboratory Tasks:</b> <b>Experiments:</b> Installing BackTrack Netcraft Keyloggers Acunetix							

<p>Nslookup SNMP Port Scanning <a href="#">NetStumbler</a> Performing an IDLE Scan with NMAP Network Sniffing</p>
<p><b>Targeted Application &amp; Tools that can be used:</b> Application Software and open source tools</p>
<p><b>Project work/Assignment: Mention the Type of Project /Assignment proposed for this course</b></p>
<p>Any appropriate tool can be given to demonstrate i.e Sql injections.</p>
<p><b>Text Book</b> Rafay Baloch, 2014: “Ethical Hacking and Penetration Testing Guide” Apple Academic Press Inc.</p>
<p><b>References</b> Gary Hall, Rrin Watson, 2016: “Hacking: Computer Hacking, Security Testing, Penetration Testing, and Basic Security”. James Corley, Kent Backman, Michael Simpson, 2010: “Hands-On Ethical Hacking and Network Defense”, 2nd Edition, Cengage Learning.</p>
<p>Topics relevant to “EMPLOYABILITY SKILLS”: BackTrack - Changing the Default Screen Resolution for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.</p>



## CSA3073: DATA SECURITY AND PRIVACY

<b>Course Code:</b> CSA3073	<b>Course Title: DATA SECURITY AND PRIVACY</b> <b>Type of Course: Elective Theory</b>			<b>L- T- P- C</b>	3	0	0	3
<b>Version No.</b>	1.0							
<b>Course Pre-requisites</b>								
<b>Anti-requisites</b>	NIL							
<b>Course Description</b>	The purpose of this course is to sensitize security in Big Data environments. This course will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches the principles and practices of big data for improving the privacy and the security of computing systems. Big data is being applied in areas where there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delves into a set of techniques for defending big data techniques against breaching of big data (the privacy aspect) and against malicious attacks (the security aspect).							
<b>Course Objective</b>	The objective of the course is to familiarize the learners with the concepts of <b>BIG DATA SECURITY AND PRIVACY</b> and attain <b>Skill Development</b> through <b>Participative Learning</b> techniques.							
<b>Course Outcomes</b>	<b>On successful completion of this course the students shall be able to:</b> <ol style="list-style-type: none"> <li>i. Define cryptographic principles and mechanisms to manage access controls in Big Data system.[Knowledge]</li> <li>ii. Explain security risks and challenges for Big Data system.[Knowledge]</li> <li>iii. Recognize all security related issues in big data systems .[Comprehension]</li> <li>iv. Apply Kerberos configuration for Hadoop ecosystem components.[Application]</li> </ol>							
<b>Course Content:</b>								
<b>Module 1</b>	Big Data Privacy, Ethics And Security	Assignment/Quiz	Big data security-organizational security	<b>08 classes</b>				
<b>Topics:</b> Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security. Assignment: Big data security-organizational security								
<b>Module 2</b>	Security, Compliance, Auditing, And Protection	Assignment	communication protocols for each of the Hadoop ecosystem components	<b>08 classes</b>				
<b>Topics:</b> Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems. Assignment: communication protocols for each of the Hadoop ecosystem components								
<b>Module 3</b>	Hadoop Security Design, Hadoop Ecosystem Security	Case study	Kerberos configuration for ecosystem tools	<b>08 classes</b>				
<b>Topics:</b>								

Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration. Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume, HBase, Sqoop.

Assignment: Kerberos configuration for Hadoop ecosystem tools

<b>Module 4</b>	Data Security & Event Logging	Case study	Event monitoring in Hadoop cluster	<b>08 classes</b>
<p><b>Topics:</b>            Integrating Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM system – Setting up audit logging in hadoop cluster            Assignment: Event monitoring in Hadoop cluster</p>				
<p><b>Assignment:</b>            1. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. <a href="#">Presidency University Library Link</a> .            2. Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.</p>				
<p><b>Text Book(s):</b>            1. Sudeesh Narayanan, “Securing Hadoop”, Packt Publishing, 2013.            2. Ben Spivey, Joey Echeverria, “Hadoop Security Protecting Your Big Data Problem”, O’Reilly Media, 2015.</p>				
<p>Topics related to development of “FOUNDATION”: Steps to secure big data ,Classifying Data.</p> <p>Topics related to development of “EMPLOYABILITY”: Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume</p>				

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