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PROGRAMME REGULATIONS & CURRICULUM

2022-25

PRESIDENCY SCHOOL OF INFORMATION SCIENCE

BACHELOR OF COMPUTER APPLICATIONS

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PRESIDENCY UNIVERSITY

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Approved by AICTE, New Delhi

PRESIDENCY SCHOOL OF INFORMATION SCIENCE

Program Regulations and Curriculum

2022-2025

BACHELOR OF COMPUTER APPLICATIONS

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

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

Regulations No.: PU/AC-24.6/SOIS05/BCA/2022-2025

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 2024-2027.
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 2022-2025 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 Degree Program Regulations and Curriculum, 2022-2026;

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 2022-2025 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 2022-2025 offered by the Presidency School of Information Science (PSIS):

1. Bachelor of Computer Applications abbreviated as BCA.

2. Bachelor of Computer Applications in Gaming and Graphics, abbreviated as BCA. (Gaming and Graphics).

3. Bachelor of Computer Applications in Augmented Reality and Virtual Reality, abbreviated as BCA. (Augmented Reality and Virtual Reality).

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: [Disciplinary knowledge]: Capable of demonstrating comprehensive knowledge and understanding of Computer Applications, Data Science and AI/ML techniques.

PSO-2: [Problem Solving]: Identify, formulate and apply appropriate techniques in the areas related to Software development, big data, Network, Cloud computing technologies and related domains of varying complexities in real-time applications.

PSO-3: [Design/development of Applications]: Conceive, Design and Develop Various Computer Applications and be able to apply data science and AI/ML techniques in specific domains such as healthcare, finance, agriculture, 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 2nd year (3rd 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**

Table 1: Assessment Components and Weightage for different category of Courses		
Nature of Course and Structure	**Evaluation Component**	**Weightage**
Lecture-based Course 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%
Lab/Practice-based Course P component in the L-T-P Structure is predominant (Examples: 0-0-4; 1-0-4; 1-0-2; etc.)	Continuous Assessments	75%
	End Term Examination	25%
Skill based Courses 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 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.

Table 2: Durations and Credit Equivalence for Transfer of Credits from SWAYAM-NPTEL/ other approved MOOC Courses

Sl. No.	Course Duration	Credit Equivalence
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 (Sub-Clause 2.6.4.1), 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 (2022-2025) 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.

Table 3: BCA 2022-2025: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets

Sl. No.	Baskets	Credit Contribution
1	School Core	30
2	Program Core	72
3	Discipline Elective	12
4	Open Elective	6
	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 University 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

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

Table 3.1 : School Core						
S.No	**Code**	**Course Name**	**L**	**T**	**P**	**C**
1.	CSA1004	Programming in Python	1	0	4	3
2.	CSA3001	Capstone Project	-	-	-	4
3.	MAT1006	Statistical Methods and Techniques	3	0	0	3
4.	MAT2007	Applied Mathematics	3	0	0	3
5.	CSA3008	Internship	-	-	-	8
6.	CSA2099	Python Coding and Practice	0	0	3	0
English and Foreign Languages Basket (Min 4 Credits)						
7.	ENG1003	Communicative English	2	0	0	2
8.	ENG2005	Technical Written Communication	2	0	0	2
9.	FRL1001	Basic Spanish	2	0	0	2
10.	FRL1002	Basic French	2	0	0	2
11.	FRL1003	Basic German	2	0	0	2
Kannada Basket (Min 1 Credits)						
12.	KAN1001	Kali Kannada	1	0	0	1
13.	KAN2001	Thili Kannada	1	0	0	1
Soft Skills Basket (Min 4 Credits)						
14.	PPS1001	Introduction to soft skills	0	0	2	1
15.	PPS1006	Employability for Young Professionals	0	0	2	1
16.	PPS2002	Being Corporate Ready	0	0	2	1
17.	PPS3001	Problem Solving through Aptitude	0	0	2	1
Non-Credit Pass/Fail Type Courses (Mandatory Credits)						
18.	CHE1018	Environmental Science	1	0	2	0
		Minimum Credits to be Earned From basket				**30**

Table 3.2: Program Core (PC)						
S.No	**Code**	**Course Name**	**L**	**T**	**P**	**C**
1.	ECE2009	Digital Computer Fundamentals	2	0	2	3
2.	CSA1001	Problem Solving using C	2	0	4	4
3.	CSA1002	Web Design and Development	1	0	4	3
4.	CSA1003	Fundamentals of Data Science	2	0	2	3
5.	CSA2001	Data structures and Algorithms	3	0	2	4
6.	CSA2002	Computer Organization	3	0	0	3
7.	CSA2003	Relational Database Management Systems	2	0	4	4
8.	CSA1005	Object Oriented Programming using Java	1	0	4	3
9.	CSA2004	Computer Networks	2	0	2	3
10.	CSA1006	Operating Systems and Unix Programming	2	0	2	3
11.	CSA2005	Analysis of Algorithms	3	0	0	3
12.	CSA2006	Fundamentals of Software Engineering	3	0	0	3
13.	CSA2007	Data Mining	3	0	0	3
14.	CSA2008	Essentials of Cloud Computing	3	0	0	3
15.	CSA2009	Web 2.0	1	0	4	3
16.	CSA1007	Introduction to DevOps	3	0	0	3
17.	CSA3002	Machine Learning Algorithms	2	0	2	3
18.	CSA3003	Android Mobile Applications Development	1	0	4	3
19.	CSA2010	Software Testing	2	0	2	3
20.	CSA3004	Big Data Analytics	2	0	2	3
21.	CSA3005	Internet of Things	1	0	4	3
22.	CSA3006	Blockchain Technology	3	0	0	3
23.	CSA3007	Data Analytics and Business Intelligence	2	0	2	3
		Total No. of Credits				**72**

Table 3.3: Discipline Elective (DE)						
S.No	**Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CSAXXXX	Discipline Elective– I	3	0	0	3
2	CSAXXXX	Discipline Elective– II	3	0	0	3
3	CSAXXXX	Discipline Elective– III	3	0	0	3
4	CSAXXXX	Discipline Elective– IV	3	0	0	3
		Total No. of Credits				**12**

Table 3.4: Open Electives (OE)						
S.No	**Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CSAXXXX	Open Elective -I	3	0	0	3
2	CSAXXXX	Open Elective -II	3	0	0	3
		Total No. of Credits				**6**

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

Table 3.7 : Discipline Elective – Minimum of 6 credits is to be earned by the student in a particular track and overall 12 credits.

Track 1 - Computer Application Basket						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1.	CSA3035	Image Processing	3	0	0	3
2.	CSA3022	Advanced Java	1	0	4	3
3.	CSA3023	Advanced Data bases	1	0	2	3
4.	CSA3024	Advanced Python	1	0	4	3
5.	CSA3027	Cryptography and Network security	3	0	0	3
6.	CSA3028	Embedded Systems	2	0	2	3
7.	CSA3029	Storage Area Networks	3	0	0	3
8.	CSA3032	Semantic Web Technologies	3	0	0	3
9.	CSA3033	Robotic Process Automation	3	0	0	3
10.	CSA3034	Parallel Computing	3	0	0	3
11.	CSA3036	Bio Informatics	3	0	0	3
12.	CSA3049	Software Metrics and Quality Management	3	0	0	3
13.	CSA3050	Ethical Hacking	3	0	0	3
14.	CSA3051	.Net Programming Using C#	1	0	4	3
Track 2 - Gaming and Graphics						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CSA3018	2D Game Design and Development	2	0	4	4
2	CSA3060	Video and Audio for Game Development	2	0	2	3
3	CSA3061	Assets for Game Production	0	0	4	2
4	CSA3019	3D Game Engine	2	0	4	3
5	CSA3062	Game programming for Hand held Devices	1	0	4	3
Track 3 – Immersive Application						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CSA3053	3D & VR Workflows and Theories	3	0	0	3
2	CSA3054	360 Video Production	0	0	4	2
3	CSA3055	Mixed Reality for Hand held Devices	1	0	4	3
4	CSA3056	Intelligent Signal Processing	3	0	0	3
5	CSA3021	Motion Capture	3	0	0	3

20. List of Open Electives to be offered by the School / Department

Table 3.8 : Open Elective Courses Baskets: Minimum Credits to be earned from this Basket is 6						
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	noc24-cs27	Foundation of Cyber Physical System	12 Weeks
2	noc24-cs12	Affective Computing	12 Weeks
3	noc24-cs29	Getting Started with Competitive Programming	12 Weeks
4	noc24-cs57	The Joy of Computing using python	12 Weeks

21.2 NPTEL - Open Elective Courses for BCA

Sl. No.	**Course ID**	**Course Name**	**Duration**
1	noc24-cs04	Privacy and Security in Online social media	12 Weeks
2	noc24-cs27	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**					**BASKET**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
			L	**T**	**P**	**C**	**CONTACT HOURS**			
1.	MAT2007	Applied Mathematics	3	0	0	3	3	School Core	S	-
2.	ECE2009	Digital Computer Fundamentals	2	0	2	3	4	Program Core	S	-
3.	CSA1001	Problem Solving using C	2	0	4	4	6	Program Core	S	
4.	CSA1002	Web Design and Development	1	0	4	3	5	Program Core	S	
5.	CSA1003	Fundamentals of Data Science	2	0	2	3	4	Program Core	S	
	ENG1003	Communicative English	2	0	0	2	2	School Core	S	
6.	PPS1001	Introduction to soft skills	0	0	2	1	2	School Core	S	HP
		TOTAL	**12**	**0**	**14**	**19**	**26**	-	-	-
Semester 2										
			CREDIT STRUCTURE							**COURSE ADDRESSES TO**
S. NO.	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**BASKET**	**TYPE OF SKILL**	
1	CSA1004	Programming in Python	1	0	4	3	5	School Core	S	
2	MAT1006	Statistical Methods and Techniques	3	0	0	3	3	School Core	S	
3	CSA2001	Data Structures and Algorithms	3	0	2	4	5	Program Core	S	
4	ENG2005	Technical Written Communication	2	0	0	2	2	School Core	S	
5	KAN1001/ KAN2001	Kali Kannada/Thili Kannada	1	0	0	1	1	School Core	S	
6	CSA2006	Fundamentals of Software Engineering	3	0	0	3	3	Program Core	S	
7	CSA2002	Computer Organization	3	0	0	3	3	Program Core	S	

8	PPS1006	Employability for Young Professionals	0	0	2	1	2	School Core	S	HP
		TOTAL	**16**	**0**	**8**	**20**	**24**	-	-	-

Semester 3										
			CREDIT STRUCTURE							
S.NO.	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**BASKET**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
1	CSA2003	Relational Database Management Systems	2	0	4	4	6	Program Core	S	
2	CSA1005	Object Oriented Programming using Java	1	0	4	3	5	Program Core	S	
3	CSAXXXX	Discipline Elective – I	3	0	0	3	3	Discipline Elective	EM	
4	CSA1006	Operating Systems and Unix Programming	2	0	2	3	4	Program Core	S	
5	CSA2005	Analysis of Algorithms	3	0	0	3	3	Program Core	S	
6	CSAXXXX	Discipline Elective – II	3	0	0	3	3	Discipline Elective	EM	
7	PPS2002	Being Corporate Ready	0	0	2	1	2	School Core	S	HP
		TOTAL	**14**	**0**	**12**	**20**	**26**	-	-	-

Semester 4										
			CREDIT STRUCTURE							
S.NO.	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**BASKET**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
1	CSA2004	Computer Networks	3	0	0	3	3	Program Core	S	
2	CSA2007	Data Mining	3	0	0	3	3	Program Core	S	
3	CSA2008	Essentials of Cloud Computing	3	0	0	3	3	Program Core	S	
4	CSAXXXX	Discipline Elective – III	3	0	0	3	3	Discipline Elective	EM	
5	CSA2009	Web 2.0	1	0	4	3	5	Program Core	S	
6	PPS3001	Problem Solving through Aptitude	0	0	2	1	2	School Core	S	
	CSA1007	Introduction to DevOps	3	0	0	3	3	Program Core	S	
	CHE1018	Environmental Science	2	0	0	0	2	School Core	S	
7	CSA3001	Capstone Project	--	--	--	4	--	School Core	S	
8	PPS3001	Problem Solving through Aptitude	0	0	2	1	2	AEC	S	HP
		TOTAL	**18**	**0**	**8**	**24**	**26**	-	-	-

Semester 5										
			CREDIT STRUCTURE							
S.NO.	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**BASKET**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
1	CSA3002	Machine Learning Algorithms	2	0	2	3	4	Program Core	S	
2	CSA3003	Android Mobile Applications Development	1	0	4	3	5	Program Core	S	
3	CSA2010	Software Testing	2	0	2	3	4	Program Core	S	
4	CSA3004	Big Data Analytics	2	0	2	3	4	Program Core	S	
5	CSA3005	Internet of Things	1	0	4	3	5	Program Core	S	
6	XXX XXX	Open elective – I	3	0	0	3	3	Open Elective	EN	
7	CSA2099	Python Coding and Practice	0	0	3	0	3	School Core	S	HP
		TOTAL	**11**	**0**	**17**	**18**	**28**	-	-	-

Semester 6										
			CREDIT STRUCTURE							
S.NO.	**COURSE CODE**	**COURSE NAME**	**L**	**T**	**P**	**C**	**CONTACT HOURS**	**BASKET**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
1	CSAXXXX	Discipline Elective IV	1	0	4	3	5	Discipline Elective	EM	
2	CSA3007	Data Analytics and Business Intelligence	2	0	2	3	4	Program Core	S	
3	CSA3006	Blockchain Technology	3	0	0	3	3	Program Core	S	
4	XXXX XXX	Open Elective – II	3	0	0	3	3	Open Elective	EN	
5	CSA3008	Internship	-	-	-	8	0	School Core	S	
		TOTAL	**9**	**0**	**6**	**20**	**15**	-	-	-

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.

School Core:
CSA1004 – Programming in Python

Course Code: CSA1004	**Course Title:** Programming In Python **Type of Course:** Theory & Integrated Laboratory	**L-T-P-C**	**1**	**0**	**4**	**3**
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	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. 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					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using Pythonand attain **Skill Development** through E**xperiential Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Demonstrate problem solving through understanding the basics of python (Application) 2. Manipulate functions and data structures. (Application) 3. Apply Tuple, Dictionaries, File and Exception Handling concepts to solve real time problems (Application) 4. Practice object-oriented programming (Application) 5. Produce data visualization using modules and packages (Application)					
Course Content:						
Module 1	**Problem Solving Techniques and Basics of Python Programming**	assignments	Quizzes form basics of python		**15 Sessions**	
Basics of problem solving techniques, Basics of Python programming, operators and expressions, decision statements, loop control statements.						
Module 2	**Function, String and List**	Quizzes and assignments	Comprehension based Quizzes and assignments		**20 Sessions**	
Functions, strings, lists, list processing: searching and sorting, nested list, list comprehension						

Module 3	**Data Structures, File and Exception handling**	Term paper/Assignment	Quizzes form advanced python	**20 Sessions**
Tuples and dictionaries, sets, file handling, exception handling.				
Module 4	**Object-Oriented Programming and Data Visualization**	Term paper/Assignment	Application on data visualization	**20 Sessions**
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.

MAT1006 – Statistical Methods and Techniques

<table>
<tr><td>Course Code:
MAT1006</td><td colspan="4">Course Title: Statistical Methods and Techniques

Type of Course:</td><td>L- T- P- C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Nil</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">To acquaint students with various statistical methods. To cultivate statistical thinking among students. To prepare students for future courses having quantitative components.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of “Statistical Methods and Techniques”and attain Skill Development Through Problem Solvingtechniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of this course the students shall be able to:

CO1: Recognize the different techniques of graphical representation of statistical data.

CO2: Predict the characteristics of statistical data with the help of measures of central tendency, dispersion, correlation and regression.

CO3: Interpret the symmetry of a data set with the help of measures of skewness and kurtosis.

CO4: Employ suitable formulae for solving problems pertaining to the basic probability, additive and multiplicative laws for both independent and dependent events.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="6">Data distribution and Concepts of Central Tendency and Dispersion</td><td colspan="3">15 classes</td></tr>
<tr><td colspan="10">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.

Introduction to Central Tendency, Mean – Arithmetic Mean, Positional averages: quartiles, deciles and percentiles, Mode for unclassified, grouped and ungrouped data- Interpretation and Examples.

Introduction to Measures of Dispersion, Range, Quartile Deviation, Variance, Standard Deviation and Coefficient of variation – Interpretation and Examples.</td></tr>
</table>

Module 2	**Skewness, moments and Kurtosis**			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.				
Module 3	**Correlation and Regression**			10 classes
Introduction to Covariance, Correlation, Rank Correlation, Karl Pearson's correlation coefficient, standard error of correlation coefficient, Regression Analysis – Examples.				
Module 4	**Probability**			10 classes
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, 7th 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. Montogomery 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.

MAT2007 – Applied Mathematics

Course Code: MAT2007	**Course Title:** Applied Mathematics **Type of Course:** School Core	**L- T- P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	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.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of " Applied Mathematics" and attain Skill Development through Problem Solving techniques.**					
Course Outcomes	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.					
Course Content:						

Module 1	**Trigonometry and Analytical Geometry**			**10 classes**

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.

Module 2	**Differential Calculus**			**12 classes**

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.

Module 3	**Integral Calculus**			**10 classes**

Integral as limit of sum, fundamental theorem of calculus, indefinite integrals, methods of Integration: substitution method, integration by parts and by partial fraction technique.				
Module 4	**Matrices**			**12 classes**
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, 9thEdn, 1998.
3. Ron Larson, Elementary Linear Algebra, Brooks/Cole Cengage Learning, 7thEdn., 2015.

References

1. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2010.
3. David C. Lay, Linear Algebra and its Applications, 3rd 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, 4th 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, 11thEdn, 2020.
9. Robert E, Moyer, Trigonometry, Mc. Graw Hill, Addision-Wesely, 4th 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
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/

CSA3001 – Capstone Project

Course Code: CSA3001	**Course Title:** **Capstone Project** **Type of Course:** **Project**	**L- T-P- C**	-	-	-	4
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	The Capstone Project course is a culmination of the BCA program, enabling students to apply their technical knowledge and skills to solve real-world problems. This course fosters innovation and creativity, guiding students through the end-to-end development of software, applications, or IT solutions. Students collaborate in teams or individually to identify a problem, design solutions, and implement them using industry-relevant tools and technologies. The course emphasizes project planning, coding, testing, and documentation, with mentorship provided by faculty. Through this experiential learning opportunity, students gain practical exposure, enhance their problem-solving abilities, and prepare for careers in the IT industry.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain Employability **Skills** through Experiential **Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Analyze complex real-world problems, evaluate potential solutions, and select appropriate technologies and methodologies to design an effective solution. *(Analyze)* 2. Design, develop, and implement a functional project by applying programming, database management, and software engineering principles. *(Apply)* 3. Collaborate effectively in teams, document the development process comprehensively, and present the project outcomes professionally to diverse stakeholders. *(Create)*					

CSA3008 - Internship

Course Code: CSA3008	**Course Title: Internship** **Type of Course:**	**L- T-P- C**	-	-	-	08
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	During the summer internship course, students have the opportunity to witness science and technology in action, gaining insight into the methods of scientific experimentation. This experience allows them to operate sophisticated equipment, observe multidisciplinary teams addressing techno-economic problems, and apply principles of management learned in class. The course enhances language, communication, and interpersonal skills through seminars, group discussions, and project report preparation. With a strong foundation in mathematics and science, students can opt for Project Work and Dissertation at the university, Project Work in an Industry/Company/Research Laboratory, or an Internship Program in an Industry/Company.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain **Employability Skills** through **Experiential Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 4. Demonstrate the application of theoretical knowledge and practical skills acquired during academic coursework in a real-world setting. 5. Develop effective problem-solving skills by identifying, analyzing, and proposing solutions to challenges encountered during the internship experience. 6. Improve communication skills by effectively articulating ideas, presenting findings, and interacting professionally with colleagues, supervisors, and stakeholders. 7. Develop adaptability and a capacity for continuous learning by successfully navigating a dynamic work environment, acquiring new skills, and adapting to evolving tasks and responsibilities.					

ENG1003 – Communicative English

Course Code: **ENG 1003**	**Course Title: Communicative English** **Type of Course: School Core** **Theory Only**	**L- T- P- C**	**2**	**0**	**0**	**2**
Version No.	1.0					
Course Pre-requisites	PUC level basic English Language Skills					
Anti-requisites	NIL					
Course Description	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.					
Course Objectives	The objective of the course is skill development of student by using Participative Learning techniques					
Course Outcomes	1. Explain basic Communication Process. 2. Apply speaking skills in various situations. 3. Demonstrate writing strategies in drafting business letters. 4. Interpret the ideas of the author in the text.					
Module 1	**Art of Communication**	**Assignment**	**Written Assignment**	**Classes-7**		
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 Chronomics						
Module 2	**Listen and Speak**	**Extempore**	**Speech/ Narration/Role Play**	**Classes -7**		
Topics: **1. Narration** – Rules Motivational Stories –Role Play, Story Circle, Jigsaw Tale **2. Conversations** At the Bank 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

Module 3	**Business Writing**	**Assignment (Case study)**	**Exercise & Quiz**	**Classes-7**

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)

Module 4	**Reading Skills**	**Assignment (Reading comprehension)**	**Exercise & Quiz**	**Classes-7**

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

Targeted Application & Tools that can be used: Relevant videos from YouTube and articles for all the skills will be used to reinforce the concepts.

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

1. **Written Assignment on Communication skills during pandemic/natural calamity/unfavorable situation.**
2. **Quizzes based on all four modules.**
3. **Summarizing / analyzing written documents, short stories and conversations.**

Text Book

1. Course Material by the Instructor.
2. PPT's and Videos and Worksheets provided by the instructor.

References

1. Hart, Steve. Nari, Aravind R. and Bhambhani, Veena. *Embark: English for Undergraduates*. New Delhi; Cambridge University Press, 2016.
2. J. K. Gangal, *A Practical course in Spoken English*, PHL Learning Private Limited, Delhi-2014.

Web Resources

1.https://presiuniv.knimbus.com/user#/searchresult?searchId=Communication%20Skills
2. https://presiuniv.knimbus.com/user#/searchresult?searchId=Communicative%20English

Topics relevant to development of " EMPLOYABILITY SKILLS": PRESENTATIONS AND PUBLIC SPEAKING
Topics relevant to development of "PROFESSIONAL SKILLS": Business Writing

ENG2005 – Technical Written Communication

ENG2005	**Technical Written Communication**	**L-T- P-C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	ENG2005 Technical Written Communication					
Anti-requisites	**NIL**					
Course Description	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.					
Course Objective	This course is designed to improve the learners' employability skills by using problem solving methodologies.					
Course Outcome	On successful completion of the course the students shall be able to: 1) Apply strategies and techniques for organizing and drafting descriptions and specifications. 2) Develop skills in writing sentences and paragraphs for content on websites and blogs. 3) Write technical/professional emails, letters and memo					
Course Content:						
Module 1	**Technical Descriptions and Specifications**					**15 Classes**
• Technical ICT vocabulary errors/full forms of common ICT words • Using proper punctuation • ICT product descriptions • Writing instructions • User guides (step-by-step instructions, procedures, manuals)						
Module 2	**Informative Summaries**					**10 Classes**
Topic-1: Creating Infographics Topic-2: Creating summary maps						
Module 3	**Technical Correspondence**					**5 Classes**
Topic-1: **Business & Official** 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

Course Code: KAN1001	**Course Title: Kali Kannada** **Type of Course: School Core**	**L- T-P-C**	1	0	0	1
Version No.						
Course Pre-requisites	**Mother tongue with thorough knowledge**					
Anti-requisites	_					
Course Description	This course aims to help the non Kannada speaking students to converse in Kannada for their day- to –day life activities. It supports to develop strong cognitive skills, use of local language, helps to mingle with the local society,. At the end of the course, the students will have better skills, to the students of Engineering for a better communication. Furthermore, this course is offered to all the students, irrespective of their domain.					
OBJECTIVE OF THE COURSE	**The objective of the course is SKILL DEVELOPMENT of students by using PARTICIPATIVE LEARNING techniques**					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1] Identify Alphabets and few words with phonetic sound ; understand and express Kannada language for social interaction and basic reading capacity					

	2] Recognize different basic Kannada vocabulary to know about others perspectives. 3] Use simple kannada in the different contexts 4] Respect the Regional Language and Culture.
Course Content:	The course contents in the form of different modules each module having similar topics in order in which we have given such type of the topics are arranged from given topics 1 Credit course must have 4 modules, 2 Credit course must have 5 modules

Module 1	**Alphabet – VarNamale,**	**Assignment**	**Pronunciation Listening**	**No. of Hours 3**

*__Alphabet__ –varNamale,
*__Vowels__-Short vowels,Long vowels, Pronunciation of vowels,writing vowels
*__Consonants__,(vyanjanagalu)-classified consonants, unclassified consonants, pronunciation of consonants, Unseparated (alpa praana), Aspirated (mahaapraana),Nasals(anunaasika)
*__Origin of sound__

Module 2	**Parts of Speech**	**Pronunciation Practice**	**Vocabulary Practice to remember the words, Translation and transliteration**	**No. of Hours 4**

Parts of Speech
1. Nouns
2. Pronoun
3. Adjective
4. Verbs
5. Adverbs
6. Prepositions
7. Conjunctions
8. Interjections

Module 3	**TENSE & GENDER**	**Assignment**	**Speaking Listening Practice conversation**	**No. of Hours 4**

* **Tense -** Types and Examples
* **Gender** – Types and Examples
* Simple Sentences using Tense and Gender

Module 4	**SAMBHASHANE (CONVERSATION)**	**Assignment**	**Speaking Listening Practice conversation**	**No. of Hours 4**

* **Conversation** (sambhaashane)
Interrogative words and Interrogative sentences
Introducing each other

Conversation on Enquiring about room Conversation on Enquiring about friends family Conversation between doctor and patient Conversation in vegetable market List of simple proverbs
Practice to speaking with friends different context should conversation **Practice: Translation and transliteration in kannada**
Assignment: Assignment proposed for this course: students should write Alphabet and simple kannada vocabularies in English Transliteration form, students should record audio or video of kannada vocabularies and simple sentence reading.
Practice speaking , self-introduce video with audio or audio , Translation **Activities: by telling and giving examples of other Languages if those Lecturer know other languages**
Text Book: In the name of Kali kannada first time we will be preparing syllabus. **Currently we are using kannada Text book introduced by Vishweshvarayya technology University in the name of kannada kali and balake kannada.**
1. **Reference books: Spoken Kannada – Publication – Kannada Sahitya parishath Bengaluru.** 2. **Kannada Kirana – Publication – Bangalore Institute of Languages, Bangalore.** 3. **Kannada kali** 4. **Balake kannada**
Topics relevant to "SKILL DEVELOPMENT": Speaking Skills, Writing Skills, Presentation Skills, Interpretation Skills, Group Presentations, Group Discussions and Seminars for Skill Development through Participative Learning techniques. This is attained through the Presentation as mentioned in the assessment component.

Course Code: KAN2001	Course Title: ತಿಳಿ ಕನ್ನಡ(THILI KANNADA) Type of Course: School Core	L- T-P- C	1	0	0	1
Version No.	1.0					
ಪೂರಕ ಅವಶ್ಯಕತೆಗಳು	ಅವಶ್ಯಕವಿಲ್ಲ, ಈಗಾಗಲೇ ಪಿಯು ಹಂತದಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಒಂದು ವಿಷಯವಾಗಿ ಕಲಿತಿರುತ್ತಾರೆ.					
ಪೂರಕವಲ್ಲದ ಅವಶ್ಯಕತೆಗಳು	ಅನ್ವಯಿಸುವುದಿಲ್ಲ.					
ಕೋರ್ಸ್ ವಿವರಣೆ	ಭಾಷೆಯನ್ನು ಮಾತನಾಡುವ, ಬರೆಯುವ ಕೌಶಲ್ಯ, ಸಾಹಿತ್ಯದ ಬಗ್ಗೆ ಸ್ಥೂಲವಾಗಿ ಪರಿಚಯಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ವ್ಯಕ್ತಿತ್ವ ವಿಕಾಸ ಹಾಗು ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು, ಪ್ರಸ್ತುತ ಸಂದರ್ಭಕ್ಕೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸಲು ಪಠ್ಯವನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಕಲೆ ಮತ್ತು ವಿಜ್ಞಾನ, ವಾಣಿಜ್ಯ, ತಂತ್ರಜ್ಞಾನ, ಅನುವಾದ ವಿಚಾರಗಳಿಗೆ ಒತ್ತನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ಒಂದು ಕ್ರೆಡಿಟ್ ಹೊಂದಿದೆ.					
ಪಠ್ಯದ ಉದ್ದೇಶ	ಭಾಗವಹಿಸುವಿಕೆ/ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯ ಕಲಿಕೆಯ ತಂತ್ರಗಳ ಮೂಲಕ ಕೌಶಲ್ಯವನ್ನು ಅಭಿವೃದ್ಧಿಪಡಿಸುವುದು ಪಠ್ಯದ ಉದ್ದೇಶವಾಗಿದೆ.					
ಕಲಿಕಾ ಫಲಿತಗಳು	ಈ ಕೋರ್ಸ್ ನ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಯಲ್ಲಿ …. • ಜನಪದ, ವಚನ, ಹೊಸಗನ್ನಡ ಕವಿತೆಗಳು, ಹೊಸಗನ್ನಡದ ಸಣ್ಣಕಥೆಗಳು ಕಲಿಕೆಯ ಮೂಲಕ ಕಾಲದ ಸ್ಥಿತ್ಯಂತರಗಳನ್ನು ಅದರ ಒಳನೋಟಗಳನ್ನು ಬೆಳೆಸುತ್ತದೆ. • ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಹಾಗೂ ಲಿಂಗಸಂಬಂಧಿ ವಿಚಾರಗಳೆಡೆ ಗಮನ ಹರಿಸುವುದರೊಂದಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಚರ್ಚಾ ಮನೋಭಾವವವು ಬೆಳೆಯುತ್ತದೆ. • ವ್ಯವಸಾಯ,ವಾಣಿಜ್ಯ, ತಂತ್ರಜ್ಞಾನಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಕೌಶಲಗಳನ್ನು ಜೀವನ ಸಂಬಂಧಿ ವಿಷಯಗಳ ಜೊತೆ ಸಮೀಕರಿಸಿಕೊಳ್ಳುವ ಸಾಧ್ಯತೆಯನ್ನು ಹೆಚ್ಚಿಸುತ್ತದೆ. • ಜೀವನದಲ್ಲಿ ಬರುವ ಅಭಿಪ್ರಾಯ ಬೇಧಗಳು, ಸಮಸ್ಯೆಗಳನ್ನು ಗುರುತಿಸಿ ಆಧುನಿಕ ಸಂದರ್ಭದಲ್ಲಿ ಮಾನವೀಯತೆಯೊಂದಿಗೆ ನಿರ್ವಹಿಸುವಂತೆ ಪ್ರೇರೇಪಿಸುತ್ತದೆ.					
ಪರಿವಿಡಿ	ಈ ವಿಷಯವು ೩ ಘಟಕಗಳನ್ನು ಒಳಗೊಂಡಿದ್ದು ಕತೆ, ಲೇಖನ ಮತ್ತು ಅನುವಾದ, ವಚನ ಇವುಗಳನ್ನು ಒಳಗೊಂಡಿದೆ.					
ಘಟಕ -೧	**ಕತೆ**	ಫ್ಯಾಂಟೆಸಿ ಕತೆಗಳ ಮೂಲಕ ಪ್ರಸ್ತುತ ಪಡಿಸುವಿಕೆ	ಪರಿಸರದ ಕತೆಗಳು –ಪುಸ್ತಕದಲ್ಲಿನ ಇತರ ಕಥೆಗಳನ್ನು ಓದುವುದು	**ಒಟ್ಟು ಅವಧಿ 6**		

1.1 ಸಂಬಳಕ್ಕೆ ಸಿಕ್ಕಿಕೊಂಡ ದೆವ್ವ- ಕೆ.ಪಿ.ಪೂರ್ಣ ಚಂದ್ರ ತೇಜಸ್ವಿ				
ಘಟಕ -೨	**ಲೇಖನ**	ವೈಚಾರಿಕ ಚಿಂತನೆಯೊಂದಿಗೆ ಚರ್ಚೆ	ಪ್ರಸ್ತುತ ವೈಜ್ಞಾನಿಕ ಆವಿಷ್ಕಾರಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳುವುದು	**ಒಟ್ಟು ಅವಧಿ 5**
2.1 ಬಿಸಿನೆಸ್ ಗೆ ಬೇಕು ಇ-ಮೊಬೈಲ್- ಯು.ವಿ ಪವನಜ, ಮನಸ್ಸಿಗೆ ಕನ್ನಡಿ ಹಿಡಿವ ಫೇಸೆಟ್ – ವಿಶ್ವನಾಥ ಶರ್ಮ				
ಘಟಕ – ೪	**ವಚನ**	ಗಾಯನ ಮತ್ತು ಪ್ರಸ್ತುತ ಸ್ಥಿತಿಗೆ ಅನ್ವಯಿಸಿ ವಿವರಿಸುವುದು.	ವಚನಕಾರರ ಚಿಂತನೆಯನ್ನು ಪ್ರಸ್ತುತ ಸ್ಥಿತಿಗೆ ಅನ್ವಯಿಸುವುದು	**ಒಟ್ಟು ಅವಧಿ 2**
ವಚನ - ಅಲ್ಲಮ ಪ್ರಭು - **೨** ವಚನಗಳು				
ಪ್ರಾಯೋಜಿತ ಕಾರ್ಯಗಳು(Assignments) : 1. ವಚನಕಾರರ ಬಗ್ಗೆ ಮಾಹಿತಿ ಸಂಗ್ರಹಿಸುವುದು. 2. ಕಥೆಗೆ ಸಂಬಂಧಿಸಿದ ಆಡಿಯೋ ಮತ್ತು ವಿಡಿಯೋ ಮಾಡುವುದು. 3. ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಇತರ ಸೃಜನಶೀಲ ಚಟುವಟಿಕೆಗಳು.				
ಪಠ್ಯಪುಸ್ತಕ(Text book) : ತಿಳಿ ಕನ್ನಡ – ಪ್ರಕಟಣೆ : ಪೆಸಿಡೆನ್ಸಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಂಗಳೂರು **ಆಕರಗಳು(Reference book) :** 5. ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ- ಸಂಪುಟಗಳು೧-೧೦ - ಜಿ.ಎಸ್ ಶಿವರುದ್ರಪ್ಪ. ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೩ 6. ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ –ಎಲ್ ಎಸ್ ಶೇಷಗಿರಿರಾವ್. ಸ್ವಪ್ನ ಬುಕ್ ಹೌಸ್, ಬೆಂಗಳೂರು. ೨೦೧೮ 7. ಪರಿಸರದ ಕಥೆಗಳು – ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ.ಪುಸ್ತಕ ಪ್ರಕಾಶನ. ಮೈಸೂರು. ೨೦೧೩ ಅಂತರ್ ಜಾಲ ಮಾಹಿತಿ 1. https://sanchaya.org 2. https://mylang.in/products/parisarada-kathe-inr 3. https://gfgc.kar.nic.in/malleshwaram/FileHandler/13-9fbd7be2-4a20-4d3d-9e1c-ed7ccc195661				
ಕೌಶಲ್ಯ ವೃದ್ಧಿಯ ವಿಷಯ: ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಪಠ್ಯ ವಿಷಯದಲ್ಲಿ ಬರುವ ವಿಚಾರಗಳನ್ನು ಚರ್ಚೆ ಸಂವಾದದ ಮೂಲಕ ಸಮಯ ಸಂದರ್ಭಕ್ಕೆ ತಕ್ಕಂತೆ ಮಾತನಾಡುವ ಕೌಶಲ್ಯವನ್ನು ವೃದ್ಧಿಸಲಾಗುವುದು. ಮತ್ತು ಸೃಜನಾತ್ಮಕ ಚಟುವಟಿಕೆಗಳನ್ನು ನೀಡುವ ಮೂಲಕ ಅಂದರೆ, ಸಂಬಳಕ್ಕೆ ಸಿಕ್ಕಿಕೊಂಡ ದೆವ್ವ ಕತೆಯನ್ನು ತಮ್ಮದೇ ಮಾಡಿನಲ್ಲಿ ಆಡಿಯೋ ಮತ್ತು ಕತೆಯ ಸನ್ನಿವೇಶಕ್ಕೆ ತಕ್ಕಂತೆ ಚಿತ್ರಗಳು ಇಲ್ಲ ಅನ್ನಿಮೇಷನ್ ಚಿತ್ರಗಳನ್ನು ಬಳಸಿಕೊಂಡು ವಿಡಿಯೋ ಮಾಡುವುದು(Group activity). ಹಾಗೆಯೇ ಚಿತ್ರ ಕತೆಯನ್ನು ಹೇಳುವಂತಹ ಚಟುವಟಿಕೆಯಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆ/ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯ ಕಲಿಕೆಯ ತಂತ್ರಗಳ ಮೂಲಕ ಕೌಶಲ್ಯವನ್ನು ಅಭಿವೃದ್ಧಿಪಡಿಸಲಾಗುವುದು.				

Course Code: KAN2001	**Course Title: ತಿಳಿ ಕನ್ನಡ(THILI KANNADA) Type of Course: School Core**		**L-T- P-C**	**1**	**0**	**0**	**1**
Version No.	1.0					
Prerequisites For The Course:	The learners should know to read and write in Kannada and should have studied Kannada as a subject in class 10 or 12.					
Course Anti Requisites	NIL					
Details Of The Course:	The course will encourage students to develop reading, writing, and communication skills in the Kannada language. The course is prepared in such a manner that it helps in the personality development of a student and enables them to be prepared for competitive exams related to Kannada. The course also covered how to develop ideas in the arts, science, commerce, technology, and translation. This course is for 1 credit and it is descriptive in nature.					
Objectives Of The Course	The objective of the course is SKILL DEVELOPMENT of student by using PARTICIPATIVE LEARNING techniques.					
Course Outcome:	CO 1: The course helps to improve the thoughts and insights on changes of the era through short stories in Kannada. CO 2: It develops discussion ability through social, political, religious, cultural and sexual matters. CO 3: It helps to co relate life related subject with agriculture, commercial, technical related skills. CO 4: Helps to identify the conjecture and problem of life in kind manner.					
Teaching Topics	This subject contains 3 modules. Those are story, Article and translation, vachana(poem).					
Module 1	**Story**	Expressing through story	Reading other stories from the book 'PARISARADA KATHEGALU- TEJASVI	**6 Classes**		
1.1 SAMBALAKKE SIKKIKONDA DEVVA- K.P POORNACHANDRA TEJASVI						
Module - 2	**Article**	Discussion through rational thinking	Getting information about the present discoveries	**5 classes**		
2.1 BUSINESSGE BEKU E-MOBILE – U.V PAVANAJA & MANASSIGE KANNADI HIDIVA PHESSET- VISHVANATHA SHARMA						
Module – 3	**Poem**	Presentation through singing	Compares the thinking of Vachanakaras to the present situation.	**2 classes**		
3.1 POEM – VACHANA- ALLAMAPRABHU						

Assignments : 1. Collecting information about Vachanakaras.
2. Making an audio and video related to the story.
3. Other creative activities related to the content.

TEXT BOOK: THILI KANNADA – PUBLISHERS: PRESIDENCY UNIVERSITY, BANGLORE

Reference :
Reference :

1. Saamanyanige saahitya charitre – samputa 1-10. G S Shivarudrappa. Swapna Book House. Bangalore. 2013.
2. Hosagannada saahitya caritre – L.S Sheshagiri Rao. Swapna Book House. Bangalore. 2018.
3. Parisarada kategalu – K.P Poornachandra Tejaswi. Pustaka Prakashana, Mysore. 2013.

Web sources:
1. https://sanchaya.org
2. https://mylang.in/products/parisarada-kathe-inr
3. https://gfgc.kar.nic.in/malleshwaram/FileHandler/13-9fbd7be2-4a20-4d3d-9e1c-ed7ccc195661

Topics relevant to SKILL DEVELOPMENT: Through interaction and discussion on the concepts from the text, students will improve their speaking abilities according to the occasion and circumstance. Additionally, by providing opportunities for creativity, such as the opportunity to create an audio and video version of the topic "Sambalakke Sikkikonda Devva(ghost captured on salary)" using appropriate images and their own voice notes(Group activity). Additionally, abilities will be developed through activities like story telling that involve interactive learning methodologies.

This is attained through assessment component mentioned in course handout.

PPS1001 – Introduction to Soft Skills

<table>
<tr><td>Course Code:
PPS1001</td><td colspan="3">Course Title: Introduction to Soft skills

Type of Course: School Core</td><td>L- T-P-C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">• Students are expected to understand basic English.
• Students should have desire and enthusiasm to involve, participate and learn.</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">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.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is skill development of student by using participative & experiential learning techniques</td></tr>
<tr><td>Course Outcome</td><td colspan="8">On successful completion of this course the students shall be able to:
CO1. Prepare professional social media profile
CO2. Recognize the significance of Soft Skills
CO3. List the techniques of unlearning poor habits and forming healthy habits
CO4. Demonstrate appropriate team behavior & people management
CO5. Identify traits, skills and attributes required for adaptability
CO6. Identify styles of communication</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="3">INTRODUCTION TO SOFT SKILLS</td><td colspan="3">Review a Movie, Personality, Technology or Book.</td><td>04 Hours</td></tr>
<tr><td colspan="9">Topics: Setting Expectations, Ice Breaker, Significance of soft skills.</td></tr>
<tr><td>Module 2</td><td colspan="3">PROFESSIONAL BRAND BUILDING</td><td colspan="3">Brand Framework Activity</td><td>04 Hours</td></tr>
<tr><td colspan="9">Topics: Significance of a profile. Creating an online profile.
Networking - 100 connections, LinkedIn as a live resume, Create a dashboard.</td></tr>
<tr><td>Module 3</td><td colspan="3">HABIT FORMATION</td><td colspan="3">Worksheets & Assignment</td><td>04 Hours</td></tr>
<tr><td colspan="9">Topics: 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.</td></tr>
</table>

Module 4	TEAM SYNERGY & PEOPLE MANAGEMENT	Classroom and outdoor team building activities.	**04 hours**
Topics: Importance of team, Get to know team needs (Maslow's Theory of needs), Trust and collaboration, Virtual Team building.			
Module 5	ADAPTABILITY	Situation based cases, THEATRIX on adaptability	**06 Hours**
Topics: Change management: VUCA, adapting to changes, growth and fixed mindset, Continuous Learning			
Module 6	EFFECTIVE COMMUNICATION	Communication activities / Emotional situations activities – group task	**04 Hours**

Topics: Different styles of communication, Difference between hearing and listening, Effective communication for success.

Self-introduction framework.

Emotional Intelligence

Topics: Self-awareness, Empathy, Self-management, Social awareness, and Relationship management

Targeted Application & Tools that can be used: LMS

Assignments proposed for this course

1. Create a dashboard on LinkedIn, Networking.
2. Prepare a habit chart

Text Book

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)
2. The Power of Habit: Why We Do What We Do in Life and Business is a book by Charles Duhigg (Module – Habit Formation)
3. Leaders eat last- Simon Sinek (Module: Team skills and People Management)
4. Social Media Marketing Workbook 2021 by Jason McDonald PhD (Module: Professional Brand building)
5. Me 2.0: Build a Powerful Brand to Achieve Career Success (Module: Professional Brand building)
6. Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones by James Clear (Module – Habit Formation)

E-Resources:

- How to Write a Blog on LinkedIn
- 7 steps for successful career planning (naukri.com)

Ted Talk:

- An introvert's guide to networking | Rick Turoczy | TEDxPortland - YouTube (Module: Professional Brand building)
- How to turn a group of strangers into a team | Amy Edmondson - YouTube (Module: Team skills and People Management)
- How Adaptability Will Help You Deal With Change | Jennifer Jones | TEDxNantwich - YouTube (Module: Adaptability)

PPS1006 - Employability for Young Professionals

<table>
<tr><td>Course Code:
PPS 1006</td><td colspan="3">Course Title: Employability for Young Professionals

Type of Course: Practical</td><td>L- T- P- C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">Students are expected to understand Basic English.
Students should have desire and enthusiasm to involve, participate and learn.</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">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.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of this course the students shall be able to:

• CO1 Show effective communication skills through self-introduction
• CO2 Analyse information through questioning technique for better decision making
• CO3 Identify individual strengths and weaknesses for self-awareness and stress management
• CO4 Apply SMART technique to achieve goals and increase productivity</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="3">Art of Questioning</td><td colspan="3">Role plays</td><td colspan="2">4 classes</td></tr>
<tr><td colspan="9">Topics: Note Taking, Framing Questions, Open-ended and Close-ended questions, Funnel technique, Probing questions, Leading questions, Rhetorical questions, 5W1H Technique</td></tr>
<tr><td></td><td colspan="5">Vocab Building</td><td colspan="3">Every Class</td></tr>
<tr><td colspan="9">Dedicate 5-10minutes towards vocabulary building in every session</td></tr>
<tr><td>Module 2</td><td colspan="3">Goal Setting & Time Management</td><td colspan="3">Journal + Outbound training</td><td colspan="2">8 Classes</td></tr>
<tr><td colspan="9">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</td></tr>
<tr><td>Module 3</td><td colspan="3">Self-introduction and Creating an Impression</td><td colspan="3">Grooming checks + Evaluation + Alumni talk</td><td colspan="2">8 classes</td></tr>
<tr><td colspan="9">Topics: 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</td></tr>
<tr><td>Module 4</td><td colspan="3">E-mail Etiquette</td><td colspan="3">Industry expert intervention</td><td colspan="2">4 Classes</td></tr>
<tr><td colspan="9">Topics: Dos and Don’ts of professional email etiquette, practice writing emails (activity)</td></tr>
</table>

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			
1) Evaluation of Self-introduction 2) LMS MCQ			

PPS2002 - Being Corporate Ready

Course Code: PPS 2002	**Course Title:** Being Corporate Ready **Type of Course:** Practical Only Course	**L-T-P-C**	**0**	**0**	**2**	**1**
Version No.	1.1					
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	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.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Being Corporate Ready" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**					
Course Out Comes	**On successful completion of this course the students shall be able to:** CO 1 **Recognize the fundamental nuances of Corporate Etiquette** CO2 **Express** thoughts/opinions in an acceptable manner in group discussions CO 3 **Demonstrate** effective presentation skills					
Course Content:						
Module 1	Presentation skills – practice and evaluation of individual presentation	Talk by Industry Expert+ Outbound Activity			**14 Sessions**	
Topics: Presentation Skills, Opening Body & Closing Body, Audibility, Speech Clarity, Fluency, Voice Modulation, Non-verbal Communication and Body Language, Talk by Industry Expert-Outbound activity. **Activity:** Individual presentations (10 hours)						
Module 2	Group Discussions – Practice and feedback	Talk by Alumni			**8 Sessions**	
Topics: Group Discussion techniques, Idea Generation, Mind Mapping, DEF, GOD, Action Plans for GD, Alumni Talk. **Activity:** Group Discussions						
Module 3	Corporate Etiquette	Role play+ Flipped classroom			**2 Sessions**	

Topics:

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

Module 4	Recap, Revision & Feedback session			**2 Sessions**

Topics:

Revision of all the modules, overall feedback from the students about the syllabus.

Targeted Application & Tools that can be used:

1. TED Talks
2. YouTube Links
3. Videos by L&D Team shared on Edhitch/YouTube.com
4. LMS

Assignments proposed for this course

3. Evaluation of Presentation skills

YouTube Links: https://youtu.be/z__jxoczNWc

TED Talks: https://youtu.be/xkq8dr_5ofs

References

References

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
8. The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience MP3 CD – Import, 22 April 2014
9. The Definitive Book of Body Language: The Hidden Meaning Behind People's Gestures and Expressions Hardcover – Illustrated, 25 July 2006
10. Crucial Conversations: Tools for Talking When Stakes Are High Paperback – Import, 1 July 2002
11. Priyadarshi Patnaik, "Group Discussion and Interview Skills", Cambridge University Press India; Second edition (1 September 2015)
12. The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success Paperback by Barbara Pachter – 16 August 2013

Web links:

1. http://www.forbes.com/sites/lisaquast/2014/04/07/office-etiquette-tips-to-overcome-bad-manners-at-work/
2. https://www.wordstream.com/blog/ws/2014/11/19/how-to-improve-presentation-skills
3. https://www.cbs.de/en/blog/15-effective-presentation-tips-to-improve-presentation-skills/

PPS3001 - Problem Solving through Aptitude

Course Code: PPS3001	**Course Title: Problem Solving through Aptitude Type of Course: Practical Only Course**			**L- T-P-C**	**0**	**0**	**2**	**1**
Version No.		1.0					
Course Pre-requisites		Students should know the basic Mathematics & aptitude along with understanding of English					
Anti-requisites		Nil					
Course Description		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.					
Course Objective		The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.					
Course Outcomes		On successful completion of the course the students shall be able to: CO1] **Recall** all the basic mathematical concepts they learnt in high school. CO2] **Identify** the principle concept needed in a question. CO3] **Solve** the quantitative and logical ability questions with the appropriate concept. CO4] **Analyze** the data given in complex problems.					
Course Content:							
Module 1	Quantitative Ability	Assignment	Bloom's Level : Application			**10 Hours**	
	Topics: Introduction to Aptitude, working of Tables, Squares, Cubes, Number Series, Wrong number series, Letter series.						
Module 2	Logical Reasoning	Assignment	Bloom's Level : Application			**20 Hours**	

	Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars
	Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS
	Continuous Evaluation • CA1 Online Test
	• CA2 Online Test
	• CA3 Online Test
	• Assignment
	Text Book 1. Quantitative Aptitude by R S Aggarwal 2. Verbal & Non-Verbal Reasoning by R S Aggarwal
	References 1. www.indiabix.com 2. www.youtube.com/c/TheAptitudeGuy/videos 3. Prepinsta.com
	Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

CHE1018 Environmental Science

Course Code: CHE1018	**Course Title:** Environmental Science **Type of Course:** School Core- Theory and Lab	**L- T- P- C**	1	0	2	0
		Contact hours	1	0	2	3
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	This course emphasizes the need to conserve biodiversity and adopt a more sustainable lifestyle by utilizing resources in a responsible way. Topics covered include basic principles of ecosystem functions; biodiversity and its conservation; human population growth; water resources, pollution; climate change; energy resources, and sustainability; Sustaining human societies, policies, and education. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Environmental Science" and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.**					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Appreciate the historical context of human interactions with the environment and the need for eco-balance. 2) Describe basic knowledge about global climate change with particular reference to the Indian context. 3) Understand biodiversity and its conservation 4) Develop an understanding on types of pollution and ways to protect the environment 5) Learn about various strategies on Global environmental management systems					
Course Content:						
Module 1	**Humans and the Environment**	Assignment	Data Collection	**01 class**		
Topics: The man-environment interaction: Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment. ***Self-learning topics:*** Humans as hunter-gatherers; Industrial revolution and its impact on the environment; Environmental Ethics and emergence of environmentalism.						
Module 2	**Natural Resources and Sustainable Development**	Assignment		**03 Classes**		
Topics: Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable. **Water resources**: Types of water resources- fresh water and marine resources;						

Soil and mineral resources: Important minerals; Mineral exploitation Soil as a resource and its degradation.

Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Advantages and disadvantages.

Self- learning topics: Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges.; Environmental problems due to extraction of minerals and use; Sustainable Development Goals (SDGs)-targets, indicators, and challenges for SDGs.

Module 3	**Environmental Issues: Local, Regional and Global**	Case study		**02 Classes**

Topics:
Environmental Pollution: Types of Pollution- air, noise, water, soil, municipal solid waste, hazardous waste; Trans-boundary air pollution; Acid rain; Smog.

Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Global change: Ozone layer depletion; Climate change

Self -learning topics: Environmental issues and scales

	Module 4	**Conservation of Biodiversity and Ecosystems**	Assignment		**02 Classes**

Topics:
Biodiversity-Introduction, types, Species interactions, Extinct, endemic, endangered and rare species, Threats to biodiversity: Natural and anthropogenic activities.

Self-learning topics: Mega-biodiversity, Hot-spots, Major conservation policies. Biodiversity loss: past and current trends, impact.

	Module 5	**Environmental Pollution and Health**	Case study		**03 Classes**

Topics:
Pollution, Definition, point and nonpoint sources of pollution, **Air pollution**- sources, major air pollutants, health impacts of air pollution.

Water pollution– Pollution sources, adverse health impacts on human and aquatic life and mitigation, Water quality parameters and standards.

Soil pollution and solid waste- Soil pollutants and their sources, solid and hazardous waste, Impact on human health.

Self-learning topics: Noise pollution, Thermal and radioactive pollution.

	Module 6	**Climate Change: Impacts, Adaptation and Mitigation**	Assignment/case		**02 Classes**

Topics:
Understanding climate change: Natural variations in climate; Projections of global climate change with special reference to temperature, rainfall and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Impacts

Vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Indigenous knowledge for adaptation to climate change.

Self-learning topics: Mitigation of climate change: Synergies between adaptation and mitigation measures; National and international policy instruments for mitigation.

	Module 7	**Environmental Management**	Case study	Data analysis	**02 Classes**

Topics:
Environmental management system: ISO 14001; Environmental risk assessment Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability.

Self-learning topics: Environmental audit and impact assessment; Eco labeling /Eco mark scheme

	Module 8	**Environmental Treaties and Legislation**	Case study	Data analysis	**01 Classes**

Topics:
Major International Environmental Agreements: Convention on Biological Diversity (CBD), Major Indian Environmental Legislations: Environmental Protection Act, Forest Conservation Act, Public awareness.

Self-learning topics: Paris Agreement, Conference of the Parties (COP), India's status as a party to major conventions: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act.

List of laboratory tasks : Any eight experiments will be conducted

1. Determination of total alkalinity of a water sample (knowledge)
2. Estimation of water hardness by EDTA method and its removal (by zeolite/ ion exchange method) (Comprehensive)
3. Estimation of copper from industrial effluents by colorimetric method (Comprehensive)
4. Estimation of iron from industrial effluents by titrimetric method/potentiometric method (Comprehensive)
5. Estimation of nickel from industrial effluents by titrimetric method (Comprehensive)
6. Estimation of chloride in drinking water by titrimetric method (Comprehensive)
7. Estimation of fluoride in ground water by colorimetric method (Comprehensive)
8. Determination of calcium in aqueous solution (Comprehensive)
9. Determination of Total Dissolved Salts, conductivity and pH of a water samples (Knowledge)
10. Determination of Chemical oxygen demand in the industrial effluent. (Comprehensive)
11. Biological oxygen demand of waste water sample (Comprehensive)
12. Determination of dissolved oxygen of an industrial effluent (Comprehensive)
13. Quality monitoring analysis of a soil sample (knowledge)
14. Flame photometric estimation of Sodium and potassium (Application)
15. Gas Chromatographic analysis of volatile organic compounds (Application)

Targeted Application & Tools that can be used:
Application areas are Energy, Environment and sustainability
Tools: Statistical analysis of environmental pollutants using excel, origin etc.

Project work/Assignment:

Assessment Type

- **Midterm exam**
- **Assignment (review of digital/ e-resource from PU link given in references section - mandatory to submit screenshot accessing the digital resource.)**
- **Lab evaluation/Assignment**
- **End Term Exam**
- **Self-learning**

Assignment 1: Write a Statement of Environment report of your town/city/state/country
Assignment 2: Individual students will carry out the analyses of polluted solid, liquid, and gaseous samples and propose suitable mitigation measures. A detailed and in-depth report needs to be submitted for each case. This may include preparation of reagents, sample preparation (extraction), chemical analysis carried out, instruments and tools used, data collected and processed, inferences made and conclusions arrived at. Necessary support is given in the form of lab manual and reference links to e-books.

Text Book

1. G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA
2. Krishnamurthy, K.V. (2003) Text book of Biodiversity, Science Publishers, Plymouth, UK.
3. Jackson, A.R. & Jackson, J.M. (2000), Environmental Science: The natural environment and human impact, Pearson Education.

Reference Books

1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
2. William P. Cunningham and Mary Ann Cunningham (2017), Principles of Environmental Science: Inquiry & Applications, 8th Edition, McGraw-Hill Education, USA.
3. Sinha N., (2020) Wild and Wilful. Harper Collins, India.
4. www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle/
5. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.
6. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

E-resources:

1. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_18126**
2. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_8761**
3. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AJ_1_02082022_3333**
4. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_3063**
5. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_20719**
6. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_16824**
7. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_3954**
8. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_491**
9. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CU STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_488**
10. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CU STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_583**
11. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=SP RINGER_INDEST_1_171**
12. **https://presiuniv.knimbus.com/user#/searchresult?searchId=3R%20principle&_t=1687427221129**
13. **https://presiuniv.knimbus.com/user#/searchresult?searchId=eco%20labelling&_t=1687427279979**
14. **https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=TE XTBOOK_LIBRARY01_06082022_395&xIndex=4**
15. **https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf**

Topics relevant to Skill Development:

Industrial revolution and its impact on the environment, Environmental impact of over-exploitation of water resources, pollution and ill effects, lab experiments for Skills development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

All topics in theory component are relevant to Environment and Sustainability.

Program Core

ECE 2009 - Digital Computer Fundamentals

<table>
<tr><td>Course Code:
ECE2009</td><td colspan="4">Course Title: Digital Computer Fundamentals
Type of Course:
Program Core& Theory& Integrated Laboratory</td><td>L-T-P-C</td><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Basic concepts of number representation, Boolean Algebra, Arithmetic and Logic Computation.</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">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.

The course also enhances the Design, Implementation and Programming abilities through laboratory tasks. The associated laboratory provides an opportunity to verify the theoretical knowledge.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Digital Computer Fundamentalsand attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of this course the students shall be able to:

1. Apply minimization techniques to simplify Boolean expressions.
2. Demonstrate the Combinational circuits for a given logic.
3. Illustrate the Sequential logic circuits.
4. Implement various combinational logic circuits using gates.
5. Verify the performance of various sequential logic circuits using gates and memory elements.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Boolean function simplification</td><td>Assignment</td><td colspan="2">Programming and Simulation task</td><td colspan="2">10 Session</td></tr>
<tr><td colspan="10">Topics:
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 & NOR) Implementations.</td></tr>
<tr><td>Module 2</td><td colspan="3">Combinational Logic circuits</td><td>Assignment</td><td colspan="2">Programming and Simulation task</td><td colspan="2">10 Session</td></tr>
<tr><td colspan="10">Topics:
Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Parity generator and checker, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders.</td></tr>
<tr><td>Module 3</td><td colspan="3">Sequential and Programmable logic circuits</td><td>Assignment</td><td colspan="2">Programming and Simulation task</td><td colspan="2">10 Session</td></tr>
<tr><td colspan="10">Topics:</td></tr>
</table>

Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy & Moore Models of finite state machines - Registers & Counters.

List of Laboratory Tasks:

Experiment No 1: Verifythe Logic Gates truth table
Level 1: Verify basic logic gates on Digital Logic simulator.
Level 2: Construct basic logic gates using universal gates and verify using Digital Logic Simulator

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):

1. Thomas L. Flyod, *"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):

1. Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, 5th Edition, Pearson Education.
{[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download (studymaterialz.in)

2. Jain, R. P., *"Modern Digital Electronics"*, 4th Edition, McGraw Hill Education (India).

3. Roth, Charles H., Jr and Kinney Larry L., *"Fundamentals of logic Design"*, 7th Edition, Cengage Learning.

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

1. NPTEL Course- "Digital Electronics Circuits" by Prof. GowthamSaha, Dept of ECE, IIT Kharagpur, NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits
2. Digital Logic Design Lectures PPT Slide 1 (iare.ac.in)
3. 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

4. Presidency university link- 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

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. Provkin, "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 Registersfor Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

CSA1001- Problem Solving Using C

Course Code: CSA1001	**Course Title:** Problem Solving Using C **Type of Course: Integrated**	**L- T-P-C**	**2**	**0**	**4**	**4**
Version No.	1.0					
Course Pre-requisites	Basic knowledge of Mathematics problems					
Anti-requisites	Nil					
Course Description	This Course will provide an introduction to foundational concepts of computer programming to students of all branches of Engineering. 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, Unions, File handling and pointers. In the lab secession students are required to solve problems based on the above concepts to illustrate the features of the structured programming.					
Course Objective	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: Outline the solution to the problem through programming. CO2: Apply the basic concepts and control structures of programming to solve the problem. CO3: Illustrate the concepts of array and strings to represent data and its operations. CO4: Apply the concepts of functions, structures, unions and Files in solving the related scenarios					
Course Content:						
Module 1	Introduction to Problem Solving: Basics of Computers	Assignment			**20 Sessions**	
Introduction to Problem Solving: Basics of Computers, Hardware, Software, Problem solving – algorithms and flowcharts. Introduction to C: Structure of C program, variables, keywords, data types and sizes, declaration and initialization of variables, storage class, operators and expression, managing input and output operations, compiling and linking.						
Module 2	Branching and looping	Assignment			**21 Sessions**	
Module 2: Branching and looping [21Hrs] [Blooms 'level selected: Application] Decision Making and Branching: if, if-else, if-else ladder, nested if and switch case Looping: for, while, do-while, and nested looping statements.						
Module 3	Arrays and Strings	Term paper/Assignment			**24 Sessions**	
Module 3: Arrays and Strings [24 Hrs] [Blooms 'level selected: Application] Arrays: Introduction, one-dimensional arrays, two dimensional arrays String: Introduction to strings, String Manipulation functions						

Module 4	Functions	Term paper/Assignment		**20 Sessions**

Module 4: Functions, Structures [20 Hrs] [Blooms 'level selected: Comprehension]

Functions: Introduction, User defined functions, Categories of functions, Actual Parameters and Formal Parameters, Passing arrays to function, and recursion. Structures: Introduction, array of structure, unions, Structures and functions.

Module 5	Pointer and Files	Assignment	**20 sessions**

Module 5: Pointers and File Handling [10 Hrs] [Blooms 'level selected: Comprehension]

Pointers: Definition, Pointer to basic data types, Pointer to a pointer, pointer operations File Handling: Definition, File Pointer, File Operations- Create, Open, Close, Read and Write. [change to be incorporated: make pointers and file handling as another module, Reduce number of hours for first module]

Assignment:

Assignment 1: Write a program to take input of 5 subjects. Find total and calculatepercent. On the basis of percent provide grade like: IF Per > 80 "A+" Per >= 65 and per <=80 "A" Per > =50 and per <=65 "B" Per >= 42 and per <=50 "C" Per < 42 "Fail".

Assignment 2: Write a program by using switch case if user enter 11 it will have are area of circle and when user enter 22 it will have area of rectangle and when user enter 33 it will give area of square when user enter 44 it will give area of triangle.

Assignment 3: Create a structure student having data members to store roll number, name of student, name of three subjects, max marks.mim marks.Declare a structure variable of student provide facilities to input data in data member and display result of student.

Text Book:

T1. 1. E. Balagurusamy, "Programming in ANSI C", Seventh Edition - Tata McGraw Hill.

References:

R1. Yale Patt, Sanjay Patel, "Introduction to Computing Systems: From bits and gates to C and beyond", McGraw Hill.

R2. Behrouz A Forouzan, Richard F Gilberg, "Computer Science: A structured programming approach using C", Cengage Learning.

R3. B.W. Kernighan & D. M. Ritchie, "The C Programming Language", Second Edition, 2001,Pearson Education

Web Resources:

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

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehostlive

Topics relevant to Skill Development : Concepts of C program , Branching and looping, storage class Functions, Structures, Pointer and Files **for Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

CSA1002- Web Design and Development

Course Code: CSA1002	**Course Title: Web Design and Development** **Type of Course: Theory and Lab Integrated courses**	**L-T-P-C**	**1**	**0**	**4**	**3**
Version No.	1.0					
Course Pre-requisites	C programming					
Anti-requisites	**NIL**					
Course Description	In this course, the students learn about the markup languages such as Advanced HTML, XML, CSS, and XSLT standards for formatting and transforming web content and server-side programming using PHP and PERL. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.					
Course Objective	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	On successful completion of the course the students shall be able to: CO1: Understand the fundamentals of web [Knowledge] CO2: Apply Javascript and CSS to create client-side applications [Application] CO3: Develop a web page using XML and server-side scripting languages such as PHP and PERL					
Course Content:						
Module 1	Introduction to Web technology basics	Assignment	Programming Task	**12 Sessions**		
Basics of web technologies: Browsers, HTML, and XHTML with examples, Programming Languages, Frameworks, Web Servers, Databases, Protocols, Data Formats.						
Module 2	Programming concept	Assignment	Data Collection/Excel	**12 Sessions**		

Javascript:Getting started with JavaScript, Declarations and Assignments, JavaScript Variables, Arrays, Datatypes in Javascript, Functional JavaScript, JSON,Regular expressions

Module 3	Practical implimentation	Assignment	Programming/Data analysis task	**13 Sessions**

XML : Introduction to XML, uses of XML, XML key components, DTD and Schemas using XML

PHP, PERL: Significance of server-side scripting, Demonstration of applications using PHP, and PERL

Targeted Application & Tools that can be used:

Project work/Assignment:

Text Book

1. 1] Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition, 2015.

References

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

2] Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st Edition, 2016

3] Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 1st Edition, 2006.

Journal (to be referred from Library resources):

1] International Journal of Web Technology (IJWT)

2] Journal of Web Engineering and Technology (JWET)

Web resources:

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

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehostlive

Topics relevant to "SKILL DEVELOPMENT": Demonstration of applications using PHP, and PERL **for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.**

CSA1003 Fundamentals of Data Science

Course Code: CSA1003	**Course Title**: FUNDAMENTALS OF DATA SCIENCE **Type of Course: Integrated**	**L- T- P- C**	**2**	**0**	**2**	**3**
Version No.	1					
Course Pre-requisites	No prerequisites					
Anti-requisites	Nil					
Course Description	The purpose of this course is to enable the students to learn the Fundamentals of Data Science- Data Analysis for effective data driven decisions and to develop the abilities of analysing the Data. The course is both conceptual and practical in nature. The course develops the analytical skills. The course also enhances the abilities to use the MS Excel through Laboratory sessions. The associated laboratory provides an opportunity to demonstrate the concepts taught and enhances the ability to apply the Data Science concepts.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Fundamentals of Data Science** and attain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1] Illustrate concepts of Data Science. 2] Demonstrate Data preprocessing and visualization techniques. 3] Apply different Data analysis techniques with Excel Spreadsheet. 4] Identify the role of ML and Domain Expertise in Data Science					
Course Content:						
Module 1	**Introduction to Data Science**	Continuous Assessment		**9 Sessions**		
Topics: Introduction to data science – Analyzing pieces of Data Science puzzle, Big Data and Grasping the difference between Data Science and Data Engineer, Data Engineering in Action- A case Study, Business Intelligence and Business Centric Data Science and distinguishing between them. Laboratory task with Excel Spreadsheet- Entering and Editing Worksheet Data, Essential Worksheet Operations, Working with Cells and Ranges, Introduction to Table, Understanding Excel files, Introducing Formulas and Functions-Creating Formulas that Manipulate Text, Creating Formulas that Count and Sum, Creating Formulas that Look up Values, Importing data- Importing from Spreadsheet file formats, Database file Formats, Text File Formats, Importing HTML Files, Importing XML files						
Module 2	**Data Cleaning and visualization**	Continuous Assessment		**7 Sessions**		

Topics: Data Visualizations- Data Story telling, Data Showing for analysts, Designing data art for activists, Designing to meet the needs of your Target Audience, Picking the most Appropriate design style, Selecting Appropriate data graphics, Best practices of Dashboard Design.
Data Cleaning Techniques- Identifying and Removing Duplicate Rows, Splitting text Removing Extra Space and Strange Characters, Converting and Classifying values, Extracting filename from a URL Filling gaps in an imported text in cells, Data Cleaning Check list, Exporting Data- CSV File, TXT file, PRN Files, Exporting to other file Formats.
Data visualization- Understanding How Excel Handles Charts, Creating and Customizing a chart, Working with Charts, Understanding Chart Types- Column Charts, Bar Charts, Line charts, Pie Charts, Scatter Charts, Area Charts, Surface Charts, Bubble Charts, Histogram Charts.

Module 3	**Data Analysis concepts in Excel**	Continuous Assessment, Quiz	**12 Sessions**

Topics: Rank, Percentile, Population, Sampling, Data Analysis, Types of Data Analysis- Descriptive Analysis, Diagnostic Analysis, Predictive Analysis, Prescriptive Analysis. Descriptive Analysis – Mean, Mode, Median, Standard Deviation, Kurosis, skewness. Sampling. Hypothesis Testing, Logic of Hypothesis Testing, Diagnostic Analysis- Inferential Analysis- T- Test.
Introducing Pivot Tables- Creating Pivot Tables Automatically, Creating Pivot Tables Manually, Analysing Data with Pivot Tables- Working with nonnumeric Data, Grouping Pivot Table Items, Creating Frequency Distribution, Filtering Pivot Tables with Slicers and with Timeline, Creating Pivot Charts, What-if Analysis, What-if Analysis in reverse, Introduction to Toolpak - Analysis of variance, correlation, covariance, descriptive statistics. Regression, T-Test, Introduction to VBA Macros- Types of VBA Macros, Creating VBA Macros.

Module 4	**Introduction to Machine Learning and Domain Expertise.**	Continuous Assessment	**12 Sessions**

Topic: Defining Machine Learning and its processes, Learning Styles Learning with supervised algorithms, Learning with unsupervised algorithms, Learning with reinforcement algorithms. KNN Algorithm

List of Laboratory Tasks:

1. Basic Excel Operations and Tables.
2. Formulas and Function with Look up
3. Look up with Importing files
4. Data Cleaning Task
5. Charts and Exporting
6. Charts and Exporting
7. Working on Pivot Table, what-if Analysis
8. Task on Toolpak Plug-in
9. Basic Macro Examples
10. KNN

11 Case Study **12** Case Study
Targeted Application & Tools that can be used
Project work/Assignment:
Assignment:
Text Book T1. Lillian Pierson, "Data Science for Dummies", 2nd ed, John Wiley & Sons, Inc., 2017. T2. John Walkenbach, "Microsoft Excel 2016 BIBLE", John Wiley & Sons, Inc., 2015.
References R1 John D. Kelleher and Brendan Tierney, Data science, The MIT Press Essential knowledge series, 2018. [Module 1]. Web resources: https://presiuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=grid&sorFieldId=none&topresult=false&content=*cloud* https://presiuniv.knimbus.com/user#/home https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehostlive
Topics relevant to development of "Skill Development": Creating Pivot Tables Automatically, Creating Pivot Tables Manually, Analysing Data with Pivot Tables- Working with nonnumeric Data, Grouping Pivot Table Items for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

CSA2001-Data Structures and Algorithms

<table>
<tr><td>Course Code:
CSA2001</td><td colspan="4">Course Title: Data Structures and Algorithms</td><td>L-T-P- C</td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Version No.</td><td colspan="9">0.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">“CSA1001 – Problem Solving Using C” course</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The purpose of the course is to provide the fundamental concepts of data structures and algorithms, to emphasize the importance of choosing an appropriate data structure and algorithm for program development.
The student should have C programming skills, to solve engineering / computational problems.
The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
With a good knowledge in the fundamental concepts of data structures and algorithm the student can gain practical experience in implementing them, enabling the student to be an effective designer, developer for new software applications.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Data Structures and Algorithms and attain Skill Development through Experiential Learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of this course the students shall be able to:
1] Implement program for given problems using fundamentals of data structures.
2] Apply an appropriate linear data structure for a given scenarios.
3] Apply an appropriate non-linear data structure for a given scenarios.
4] Analyze complexity of given searching and sorting algorithms.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Data Structure and Linear data structure – Stacks and Queues (Application)</td><td>Assignment</td><td colspan="3">Programming activity</td><td colspan="2">13 Hours</td></tr>
<tr><td colspan="10">Topics:
Introduction – Introduction to Data Structures, Types and concept of Arrays.
Stack - Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.
Queues - Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.</td></tr>
<tr><td>Module 2</td><td colspan="3">Linear Data Structure-Linked List (Application)</td><td>Assignment</td><td colspan="3">Programming activity</td><td colspan="2">12 Hours</td></tr>
<tr><td colspan="10">Topics:
Linked List - Singly Linked List, Operation on linear list using singly linked storage structures, Circular List and Applications of Linked list.
Recursion - Recursive Definition and Processes and Programming examples.</td></tr>
</table>

Module 3	Non-linear Data Structures- Trees and Graph (Application)	Assignment	Programming activity	**10 Hours**
Topics: **Trees** - Introduction to Trees, Binary tree: Terminology and Properties, Use of Doubly Linked List, Binary tree traversals: Pre-Order traversal, In-Order traversal and Post-Order traversal. **Graph** - Basic Concept of Graph Theory and its Properties and Representation Of Graphs.				
Module 4	Searching & Sorting Performance Analysis (Comprehension)	Assignment	Programming activity	**10 Hours**
Topics: **Sorting & Searching** - Sequential and Binary Search, Sorting – Selection and Insertion sort. **Performance Analysis** - Time and space analysis of algorithms – Average, best and worst case analysis.				

List of Laboratory Tasks:

Labsheet -1 [4 Practical Sessions]

Experiment No 1:

Level 1: Array and its operations

Experiment No. 2:

Level 1 - Stack and its operations with conditions(Exceptions underflow, overflow)

Level 2 - Stack application infix to postfix Conversion

Experiment No. 3:

Level 1 - Queues and its operations with conditions(Exceptions underflow, overflow)

Level 2 - Real time application implementation using queue

Labsheet -2 [4 Practical Sessions]

Experiment No. 1:

Level 1 - Linked list and its operations.

Level 2 - Real time scenario based application using Linked List

Experiment No. 2:

Level 1 - Linked list and its operations.

Level 2 - Real time scenario based application using Linked List

Labsheet – 3 [4 Practical Sessions]

Experiment No. 1:

Level 1 - Doubly linked list implementation and its operations

Level 2 - Construction of BST

Experiment No. 2:

Level 2 - Binary Search Tree Traversal

Experiment No. 3:

Level 1 - Construction of Graph

Level 2 - Graph application – Breadth first search

Labsheet – 4 [3 Practical Sessions]

Experiment No. 1:

Level 1 - Implementation of Linear Search

Level 2 - Time complexity Estimation of Linear Search

Experiment No. 2:

Level 1 - Implementation of Binary Search

Level 2 - Time complexity Estimation of Binary Search

Experiment No. 3:

Level 1 - Implementation of Sorting – Insertion Sort **Level 2 -** Time complexity Estimation of Insertion Sort
Targeted Application & Tools that can be used: C Compiler
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course
1] Problem Solving: Choose an appropriate data structure and implementation of programs. 2] Programming: Implementation of given scenario using C
Text Book 1] Richard F Gilberg and Behrouz A Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, Cengage learning, 2018.
References 1] Seymour Lipschutz , "Data Structures with C" (Schaum's Outline Series) McGraw Hill Education, July 2017 2] Robert L Kruse, Bruce P Leung and Clovis L Tondo, "Data Structures and Program Design in C", Pearson. 3] R. Venkatesan, S. Lovelyn Rose," Data Structures" Wiley, Second edition, January 2019.
Topics relevant to "SKILL DEVELOPMENT": Introduction to Data Structures, Singly Linked List, Operation on linear list using singly linked storage structures, Use of Doubly Linked List, Sequential and Binary Search, Sorting – Selection and Insertion sort for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

CSA2002-Computer Organization

Course Code: **CSA2002**	**Course Title:** Computer Organization **Type of Course:** Program Core and Theory	**L-T-P- C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	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. 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.					
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 — AnOverview 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:				
1. 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 McGrawHill, 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/Softwareinterface", 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 **ParticipativeLearning t**echniques. This is attained through the assessment component mentioned in the course handout.				

CSA2003- Relational Database Management Systems

Course Code: CSA2003	**Course Title:** Relational Database Management Systems **Type of Course: Integrated**	**L-T-P-C**	**2**	**0**	**4**	**4**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course offers detailed concept on principles and techniques required in the design and implementation of database systems. It helps the students to learn and practice data modeling using the entity-relationship diagrams. It covers relation database management (RDBMS) concepts and also provides detail knowledge on how to design, maintain and retrieve the information effectively and efficiently. The corresponding laboratory is intended to implement database design using MYSQL. All the experiments will focus on the fundamentals of database creation, populating, interactive querying which includes use of various data definition, data manipulation commands, functions, joins, sub-queries, views, set operations, procedures, triggers and executing database transactions.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Relational Database Management Systems** and attain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of this course the students shall be able to:** 1. Understand the basic concepts of database and ER modeling in designing the database. [**Knowledge**] 2. Apply Relational Algebra and Database Querying concepts in designing the database. [**Application**] 3. Analyze various normalization techniques for designing a robust database. [**Analysis**] 4. Understand the Transaction control and concurrency control mechanisms.[**Comprehension**]					
Course Content:						
Module 1	Introduction				**10 Sessions**	

<table>
<tr><td colspan="5">Topics:
Introduction to Database: Database Management System, Characteristics of Database Approach, Types of Database users, DBA, Data Models, Schema, Instance, Three-Schema Architecture, Data Independence, Disadvantages in traditional file system, advantages of database over traditional file systems.

Conceptual Modeling: Data Modeling Using Entity Relationship (ER) Model, ER Model to Table Conversion, Examples on ER model.</td></tr>
<tr><td>Module 2</td><td>Query Languages</td><td></td><td></td><td>12 Sessions</td></tr>
<tr><td colspan="5">Topics:
Relational Algebra: selection, projection, rename, set operations, Cartesian product, joins and division operator. Examples on Relational Algebra Operations.
Database Querying: DDL, DML, Constraints, Operators- BETWEEN, IN, LIKE, where clause, orderby command, Set Operators, Aggregate Functions, having clause, Views, Procedures, Cursors and Triggers.</td></tr>
<tr><td>Module 3</td><td>Designing and Refining Database Schema</td><td></td><td></td><td>10 Sessions</td></tr>
<tr><td colspan="5">Topics:
Schema Design: Problems in schema design, redundancy and anomalies
Schema refinement: 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, Rules and Types of Decomposition.</td></tr>
<tr><td>Module 4</td><td>Transaction Management and Concurrency Control</td><td></td><td></td><td>13 Sessions</td></tr>
<tr><td colspan="5">Topics:
Transaction: Transactions: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties (ACID) of Transactions, Simultaneous Transactions and their problems like dirty read, lost update and incorrect summary, Serializability, Conflict Serializability, View Serializability. Transaction Support in SQL
Concurrency Control: Need for Concurrency, Locking and Time-stamping concurrency schemes.</td></tr>
</table>

List of Laboratory Experiments:
Create Student, Employee, Banking and Library Management databases and populate with necessary data. Perform the following various experiments on those databases.

Labsheet-1[4 Practical Sessions]
Experiment No 1: [2 Sessions]
To study and implement Data Definition Language (DDL) commands and Data Manipulation Language (DML) commands of MySQL.
Level 1: Perform basic operations using Data Definition Language (Create, Alter, Drop, Truncate & Rename) and Data Manipulation Language commands on Student Database.

Experiment No. 2: [2 Sessions]

To study and implement different types of constraints, relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators.
Level 1: Create tables on Employee 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 Employee Database.

Labsheet-2[4 Practical Sessions]
Experiment No. 3: [2 Sessions]
To study and implement for aggregation of data in to groups and sub-groups using GROUP BY, HAVING clauses and sort data using ORDER BY clause.
Level 1: Implementing GROUP BY, HAVING, ORDER BY and aggregate functions on Employee Database**.**

Experiment No. 4: [2 Session]
To study and implement various 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 Employee Database.

Labsheet-3 [2 Practical Sessions]

Experiment No. 5: [2 sessions]
To study and implement Views, Procedures and Functions in MySQL.
Level 1: Implement MySQL Views and Procedures in MySQL on Banking database.

Labsheet-4 [2 Practical Sessions]
Experiment No. 6: [2 Sessions]
To study and implement Cursors and Triggers in MySQL.
Level 1: Implement MySQL Cursors and Triggers in MySQL on Employee database.

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

3] Constructing E-R diagrams.
4] Implementation on a given scenario.

Text Book

1. Elmasri R and Navathe S B, “Fundamentals of Database System”, 7th Edition, Pearson Publication, 2017.

References

1. Hector Garcia Molina, Jeffery D Ullman, Jenniffer Widom, “Database systems: The Complete Book”, 2nd edition, Pearson Publication,2013.

2. Avi Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, 7th Edition, McGraw-Hill, 2019.

Web Resources :

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

Topics relevant to “SKILL DEVELOPMENT”: DDL, DML, Constraints, Operators-BETWEEN, IN, LIKE, where clause, orderby command, Set Operators, Aggregate Functions, having clause, Views, Procedures, Cursors and Triggers **for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.**

CSA1005- Object Oriented Programming Using Java

Course Code: CSA1005	**Course Title:** Object Oriented Programming using Java **Type of Course:1] School Core** **2] Laboratory integrated**	**L-T- P-C**	**1**	**0**	**4**	**3**
Version No.	2.0					
Course Pre-requisites	**Basic Programming Skills**					
Anti-requisites	**NIL**					
Course Description	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. 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.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Object Oriented Programming Using Java** and attain **Skill Development** through **Experiential Learning**techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 1. Discuss the OOP's concept and Apply the concepts to design, implement, compile, test and execute simple Java programs.[**Understanding and Apply**] 2. Explain the concepts related to classes and Use built-in methods of String and String Buffer classes. .[**Understanding and Apply**] 3. Implement concepts of Constructors, Polymorphism, Inheritance, Interfaces and Packages with programs.[**Understanding, Analysing and Apply**] 4. Understand and use the multithreading, exception handling mechanism and file handling mechanism of Java. [**Understanding and Apply**] 5. Design the GUI form using Applet and Swing components [**Create**]					
Course Content:						
Module 1	Introduction to OOP : Class and Object (Comprehension)	Assignment	Programming activity	**8 Hours**		
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						
Module 2	Arrays, Strings , Extending Class (Comprehension)	Assignment	Programming activity	**8 Hours**		
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.

Module 3	Interface, Package and Exception Handling (Comprehension and Application)	Assignment	Programming activity	**8 Hours**

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 & Errors, Types of Exception, Handling of Exceptions: Use of try, catch, finally, throw, throws, User Defined Exceptions, Checked and Un-checked Exceptions.

Module 4	Multithreaded Programming (Applications)	Assignment	Programming activity	**8 Hours**

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

Module 5	Collection & GUI Programming (Comprehension)	Assignment	Programming activity	**8 Hours**

Topics:
The Collection Framework : Collections of Objects , Collection Types, Sets , Sequence, Map, Understanding Hashing, Use of ArrayList& 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

List of Laboratory Tasks:
Lab sheet -1 [5 Practical Sessions]
Experiment No 1:
Level1 -Programs using Control statements→ Methods with Parameters, Methods with control statements
Level2 - Demonstrations of Class, Object, Constructor, Static member, Encapsulation, Inner Class
Experiment No. 2:
Level 1 – Simple Program for Understanding Arrays and Strings.
Level2 - Programs to implement array of objects, passing and returning objects as arguments.
Lab sheet – 2 [2 Practical Sessions]
Experiment No. 1:
Level1 - Programs to demonstrate concepts of constructors and destructors

Level2 - 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.

Experiment No. 2:
Level1 – Programs to implement methods of String and String Buffer Class.
Level2 - Programs to implement Inheritance and Polymorphism, Programs to implements Interface.

Lab sheet – 3 [3 Practical Sessions]
Level 1 - Programs to demonstrate Exceptions Handlers.
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

5] 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.
2. 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.

W3. "Building java programs" 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.

CSA2004- Computer Networks

Course Code: CSA2004	**Course Title:** **Computer Networks** **Type of Course:** **Theory Course**	**L-T-P-C**	**2**	**0**	**2**	**3**
Version No.	1.0					
Course Pre-requisites	**Analog And Digital Signals, Number Representation-Binary, Decimal, Hexadecimal, Binary-Logical Operations, Frequency, Amplitude, and Phase**					
Anti-requisites	**NIL**					
Course Description	The main emphasis of this course is on the organization and management of networks. Thecourse objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in the installation, monitoring, and troubleshooting of LAN systems. Topics Include: Fundamental concepts on data communication, components, protocols and standards, network and protocol architecture, open systems interconnection, communication model, performance, error detection and recovery, Local area networks, bridges, routers and gateways, packet switching, network, and transport layer protocols					
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] Describe the basic concepts of computer networks and reference models. 2] Describe the physical and data link layer functionalities. 3] Apply the knowledge of IP addressing and routing mechanism to connect to a computer network. 4] Explain the functionalities of the transport layer and application layer.					
Course Content:						
Module 1	Introduction To Computer Networks	Assignment	Theory Task		**08 Sessions**	
Topics: Introduction, Networks, Network Types, Internet History, Protocol Layering, The OSI Model, TCP/IP ProtocolSuite, Networking Devices.						
Assignment: Quiz I						

Module 2	Physical And Data Link Layer	Assignment	Theory Task	**10 Sessions**

Topics:
Data And Signals, Digital Signals, Transmission Impairment, Performance, Error – Detection and Correction –Parity, CRC, Flow Control and Error Control-Stop and Wait, Go Back-N ARQ, Wired LAN Ethernet [extra 3 topics added in next year].
Assignment: Quiz II

Module 3	Network Layer	Assignment	Theory task	**11 Sessions**

Topics:
Network Layer Services, Packet Switching, Ipv4 Addresses, IPv4 Header, Introduction To Troubleshooting And The Future Of Networking, Ping: Internet Control Message Protocol, Trace route, Ipv6 Headers, Transition From Ipv4 To Ipv6.

Assignment: Assignment 1, Test 1

Module 4	Transport Layer and Application Layer	Assignment	Theory task	**09Sessions**

Topics:
Introduction To The Transport Layers, UDP, TCP, The Application Layer: Domain Name System (DNS),
Telnet, HTTP, SMTP, FTP.
Assignment: Assignment 2, Test 2

Targeted Application & Tools that can be used:
NIL

Project work/Assignment:

To understand the application of computer networks in daily lives the following assignments, Quizzes and Tests are included:
Assignment: 1] Module 3
Assignment: 2] Module 4

Text Book
T1. Behrouz A. Forouzan, Data Communications, and Networking 4E, 4th Edition, Tata McGraw-Hill, 2013.T2. Kumar K.L, Kumar V,

References
R1. Alberto Leon-Garcia and IndraWidjaja: Communication Networks - Fundamental Conceptsand
Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
R2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
R3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th
Edition, Elsevier, 2007.
R4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

Weblinks:
https://youtu.be/3DZLItfbqtQ
https://www.geeksforgeeks.org/last-minute-notes-computer-network/

Topics relevant to SKILL DEVELOPMENT: Networks and its relevance, OSI Model, Physical layer, Ipv4 Addresses, TCP, UDP for **Skill Development** through **Participative methodologies.** . This is attained through assessment component mentioned in course handout.

CSA1006-Operating Systems and Unix Programming

Course Code: CSA 1006	**Course Title:** OPERATING SYSTEM AND UNIX PROGRAMMING **Type of Course: Integrated**	**L-T-P- C**	**2**	**0**	**2**	**3**
Version No.	1.0					
Course Pre-requisites	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.					
Anti-requisites	Nil					
Course Description	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.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of O**perating Systems and Unix Programming** and attain **Skill Development** through **Experiential Learning** techniques.					
Course Outcomes	1. **Describe** the various OS Types, Services, structures and layers, system calls related to OS management and interpreting different stages of various process states. 2. **Describe** 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. 3. **Understand** the Memory Management and Allocation concepts 4. **Design** 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					
Course Content:						
Module 1	**Introduction to OS and System Structure**	Assignment				**8 Sessions**
Topics: **Introduction:** 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. P**rocesses:** 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:						
Module 2	**IPC and Deadlocks**	Assignment				**7 Sessions**
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

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

Reference Books

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

Web References

1. https://nptel.ac.in/courses/106108101
2. https://nptel.ac.in/courses/106106144
3. https://nptel.ac.in/courses/117106113
4. https://www.udemy.com/course/unix-getting-started/
5. 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.

CSA2005- Analysis of Algorithms

<table>
<tr><td>Course Code:
CSA2005</td><td colspan="3">Course Title: Analysis of Algorithms

Type of Course: Program Core & Theory only</td><td>L-T-P- C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">Data Structure and Algorithms</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">This intermediate course enables students to design and analyze efficient algorithms to solve problems. This course covers typical design methods such as divide-and-conquer, dynamic programming and greedy method to solve problems. The students shall develop strong analytical skills as part of this course.</td></tr>
<tr><td>Course Objectives</td><td colspan="7">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.</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">On successful completion of the course the students shall be able to:
1] Identify the efficiency of a given algorithm. [Comprehension]
2] Employ divide and conquer approach to solve a problem. [Application]
3] Illustrate dynamic programming approach to solve a given problem. [Application]
4] Solve a problem using the greedy method. [Application]
5] Discuss the techniques to solve a real-world problem based on its complexity classes. [Comprehension]</td></tr>
<tr><td>Course Content:</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td>Introduction to Algorithms</td><td>Assignment</td><td>Problem Solving</td><td colspan="4">06 Sessions</td></tr>
<tr><td colspan="8">Topics:
Algorithm Design and efficiency, measuring of running time of algorithms. Insertion sort and merge sort, Asymptotic Growth and Notations. Recurrences--Masters method.
Assignment: Comparatively evaluate bubble sort, insertion sort and mergesort.</td></tr>
<tr><td>Module 2</td><td>Review of Searching and Sorting techniques</td><td>Assignment</td><td>Programming/ Problem Solving</td><td colspan="4">12 Sessions</td></tr>
<tr><td colspan="8">Topics:
Divide and Conquer: Examples. Strassen’s Matrix multiplication.
Sorting: Quicksort, Heapsort, Lower bound of comparison-based sorting, non-comparison-based sorting: Radix sort.
Search: Review of Linear Search and Binary Search, Hashing and hash tables.</td></tr>
</table>

Assignment: Design and develop an algorithm using Divide and Conquer technique for a given scenario.

Module 3	Greedy Algorithms	Assignment	Programming/ Problem Solving	**09 Sessions**

Topics:
Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm. Huffman Codes.

Assignment: Design and Develop a solution to a given scenario using greedy method.

Module 4	Dynamic Programming	Assignment	Programming/ Problem Solving	**09 Sessions**

Topics:

Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Optimal Binary Search Trees, Chain Matrix Multiplication.

Assignment: For a given scenario, attempt the three design paradigms learned so far and argue the best approach to solve the problem

Module 5	Complexity Classes and Heuristics	Assignment	Programming/ Problem Solving	**09 Hours**

Topics:

lexity classes: P, NP, and NP-Complete Problems. Backtracking: n-Queens. Branch and bound: Travelling Salesman Problem.

Assignment: Apply backtracking algorithmic designing technique for solving queen's problems for 4, 8 and 16 inputs.

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. for **Skill Development through Problem solving methodologies**. This is attained through assessment component mentioned in course handout.
Professionally Used Software: GCC compiler.

Project work/Assignment:

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

Text Book:

T1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *'Introduction to Algorithms'*, MIT Press, 2022.

T2. J. Kleinberg and E. Tardos, *'Algorithm Design'*, Addison-Wesley, 2005.

References

R1. Anany Levitin, *'Introduction to the Design and Analysis of Algorithms'*, Pearson Education, 2003.

R2. Tim Roughgarden, *'Algorithms Illuminated'* (books 1 through 3), Soundlikeyourself Publishing, 2017,18,19 respectively.

R3. AV Aho, J Hopcroft, JD Ullman, *'The Design and Analysis of Algorithms'*, Addison-Wesley, 1974.

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

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehostlive

Topics relevant to "SKILL DEVELOPMENT": NP, and NP-Complete Problems. Backtracking: n-Queens **for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.**

CSA2006-Fundamentals of Software Engineering

Course Code: CSA2006	**Course Title:** FUNDAMENTALS OF SOFTWARE ENGINEERING **Type of Course:** Program Core - Theory	**L-T- P-C**	**3**	**0**	**0**	**3**
Version No.	1					
Course Pre-requisites	Object Oriented Concepts, Basic programming knowledge, basic understanding of algorithms					
Anti-requisites	NIL					
Course Description	The course covers software process models, software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course also covers project evaluation, planning, effort estimation and risk management aspects in software project planning. Topics include: Introduction to Software Engineering, Process Life Cycle Models, Requirement Analysis and Specification, User Interface Analysis and Design, Software Testing, Project Management, Project Planning, Effort Estimation Techniques, Project Scheduling, Project Metrics & Evaluation, Risk Management.					
Course Objective	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.					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Describe the software engineering principles, ethics and process models. 2) Identify the requirements and appropriate design models for a given application. 3) Discuss the various types of testing methods and Quality Assurance. 4) Apply project planning, scheduling, evaluation and risk management principles for a given project.					
Course Content:						
Module 1				08 Sessions		
Introduction to Software Engineering & Process Models Software and Software Engineering: Nature of Software, Software Engineering Practice,Software Myths, SDLC, Software Processes: Generic Model, Prescriptive Process Model, Unified Process Model, Agile Development: Extreme Programming, SCRUM.						
Module 2				09 Sessions		
Software Requirements and Design						

Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements,

SRS, Requirements modelling: Developing Use Cases, Developing Activity diagram and

Swimlane diagram, Design : Design concepts, Architectural design, Component based design,

User interface design.

Module 3		Assignment		8 Sessions

Software Project Management

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.

Targeted Application & Tools that can be used:
Apply project planning, scheduling, evaluation and risk management principles for a given project.

Project work/Assignment:

Project Assignment:
Assignment 1: Module 3
Assignment 2: Module 3

Textbooks:

1.Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw

Hill, 2017.

2. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGrawHill, 2018.

References:

Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011.

2. Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited,

2014.

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": Agile Development, Software Testing,White box Testing,Black box Testing **for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.**

CSA2007- Data Mining

Course Code: CSA2007	**Course Title:** Data Mining **Type of Course:** Program Core - Theory	**L-T-P- C**	3	0	0	3
Version No.	1					
Course Pre-requisites	Students are expected to be familiar with the basics of Linear Algebra, Probability and Statisticsand should have a knowledge on DBMS.					
Anti-requisites	NILL					
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 – portioning 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.**				

CSA2008- Essentials of Cloud Computing

Course Code: CSA2008	**Course Title: Essentials of Cloud Computing Type of Course: Theory**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	**Computer Network, grid computing and Java.**					
Anti-requisites	**NIL**					
Course Description	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. 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).					
Course OutComes	On successful completion of this course the students shall be able to: 1. Identify the different cloud services, applications of data in cloud**. [Remember]** 2. Apply suitable abstraction, virtualization technique in cloud environment. **[Apply]** 3. Discuss different industry platform service, applications for Business and Consumers Services**. [Understand]** 4. Managing the infrastructure services, simulator tools in cloud. **[Understand]**					
Course Objectives	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 Content:						
Module 1	Introduction to Cloud Computing (Remember)	Assignment				**10 Hours**
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.						
Module 2	Virtualization fundamentals (Apply)	Assignment				**10 Hours**

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.				
Module 3	Cloud Platforms in Industry (Understand)	Assignment		**10 Hours**
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.				
Module 4	Cloud Infrastructure (Understand)	Assignment		**10 Hours**
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.				
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course				
6] Problem Solving: Design and implement dynamic resource allocation for virtual machine using cloud computing environment.				

Text Book

1. R. Buyya, C. Vecchiola, S T. Selvi, Mastering Cloud Computing, McGraw Hill (India) Pvt Ltd., 2017
2. Barrie Sosinsky, Cloud Computing Bible, Wiley Publishing, Inc,.2011

References

1. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, "Virtualization, Business Models, Mobile, Security and more, Jones & Bartlett Learning Company, 2013
2. Ronald L.Krutz, Russell vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley Publishing Inc., 2010.
3. Gautam Shroff, Enterprise Cloud Computing - Technology, Architecture, Applications, Cambridge University Press, 2010
4. Singh, S., & Chana, I. Q-aware: Quality of service based cloud resource provisioning. Computers & Electrical Engineering, (2015).

Online References:

1. https//presiuniv.knimbs.com/user#/home
2. https://blog.storagecraft.com/7-infamous-cloud-security-breaches
3. https://csrc.nist.gov/publications/detail/sp/800-145/final
4. https://threatpost.com/contractor-accesses-2-million-vodafone-germany-customer-records/102286/
5. https://clutch.co/cloud/resources/security-trends-in-enterprise-cloud-computing

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

1. NPTEL Course on "Cloud Computing", https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. Udemy Courses on "Cloud Computing", https://www.udemy.com/topic/Cloud Computing/

Topics relevant to development of "Skill Development Aws, Azure, APIs, Aneka Cloud Platform, Virtualization, Cloud Platforms in Industry, EC2, Installation of VM Workstation**,** Cloud Infrastructure and Challenges for **Skill Development through Participative Learning techniques.** This is attained through assessment component mentioned in course handout.

CSA2009- Web2.0

Course Code: CSA2009	**Course Title:** WEB 2.0 **Type of Course:** **Program Core** **Laboratory Integrated Course**	**L- T-P- C**	**1**	**0**	**4**	**3**
Version No.	1.0					
Course Pre-requisites	Programming fundamentals (any language), Knowledge of RDBMS, HTML, CSS, and JavaScript.					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to introduce the next level of web design using Web 2.0 technologies. Web 2.0 is the business revolution in the computer industry caused by the evolution of social networking. Students will be trained in planning and designing effective web pages by writing code using current leadingtrends in the web domain, enhancing web pages with the use of JavaScript frameworks. The major focus ison the key elements of web 2.0 like Rich internet applications, Service-oriented architecture, and social web.					
Course Outcomes **Course Objectives**	After the completion of the course students shall be able to: 1. Demonstrate database-driven web application with the server-side script using PHP. 2. Employ JavaScript frameworks to develop rich internet applications. 3. Demonstrate web application using Flex architecture deployed to flash player. 4. Describe the concept of web application terminologies and internet tools for developing the social web. The objective of the course is to familiarize the learners with the concepts of WEB 2.0 and attain **Skill Development** through **Experiential Learning** techniques.					
Course Content:						
Module 1		Assignment		**9 Hours**		
Topics: Overview of internet and its evolution, Comparison of web 1.0 and web 2.0, characteristics of web 2.0, Introduction to server-side scripting-PHP, PHP and MySQL interaction, Web 2.0 technologies, Overview of JavaScript frameworks-AJAX. PHP example, AJAX example						
Module 2		Assignment		**9 Hours**		
Topics: Data interchange formats: XML, XML basics; XML Schema; Types, Sample program for XML, Overview of JQuery, JQuery example, Overview Angular JS						

Module 3		Assignment		**9 Hours**

Topics:

Overview of Flex architecture: Facebook, Angular JS example, Differences between HTML and Flex applications, Angular JS example, Flex example, Understanding ActionScript, Flex example, Differentiating between Flash player and Framework, Flex example, Understanding UI Components, Model View Controller

Module 4		Assignment		**9 Hours**

Topics:

Introduction to Social Web, Building blog-part 1, Building blog-part 2, Social networking or social media sites Wikis, blog, Youtube, Building blog-part 3, Building blog-part 4, Collaborative consumption platforms, and mashup applications, Building blog-part 5

Targeted Application & Tools that can be used:

1. To creating a social web site

List of Laboratory Task

Experiment No. 1: Learn to use a web server (Apache) and server-side scripting using PHP along with a database.
Experiment No. 2: Learn to create rich internet applications using JavaScript frameworks
Experiment No. 3: Learn to create a web application using Flex architecture
Experiment No. 4: Learn how web2.0 websites facilitate interaction among users, Eg: creating a social web site

Project work/Assignment:

Project Assignment: NIL

Text Books

1. P.J.Deitel and H.M. Deitel, "Internet and World Wide Web – How to Program", PearsonEducation.
2. Programming Flex 2 – Chafic Kazoun, O'Reilly publications, 2007

References

1. Randy Connolly, "Fundamentals of Web Development", Pearson Education
2. Robert W Sebesta, "Programming the World Wide Web", Pearson Education
3. Gottfried Vossen, Stephan," Hagemann Unleashing Web 2.0: From Concepts to Creativity",Elsevier
4. Nicholas C Zakas," Professional AJAX", Wrox publications
5. Frank. P. Coyle, "*XML, Web Services And The Data Revolution*", Pearson Education.
6. James Snell, Doug Tidwell, Pavel Kulchenko, "*Programming Web Services with SOAP*", O'Reillypublishers.

Web Resources:

1. W3schools.com

2. Developer.mozilla.org/en-US/docs/Learn
3. docs.microsoft.com
4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking
5. https://presiuniv.knimbus.com/user#/home

Topics relevant to "SKILL DEVELOPMENT": Angular JS example, Flex example, Understanding ActionScript **for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.**

CSA1007-Introduction to Devops

<table>
<tr><td>Course Code: CSA1007</td><td colspan="3">Course Title: Introduction to Devops
Type of Course: Integrated</td><td>L- T- P- C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">Agile frameworks</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course is designed to offer profound perceptions and knowledge in various tools like Git, Ansible, Jekins. 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.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is SKILL DEVELOPMENT of student by using PARTICIPATIVE LEARNING techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">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]</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td>Introduction to DEVOPS and GIT Operations</td><td>Assignment</td><td colspan="4">Data Collection/Interpretation</td><td>6 Sessions</td></tr>
<tr><td colspan="9">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.</td></tr>
</table>

Module 2	Containerization Using Docker	Case studies	Case studies / Case let	**6 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	**8 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**
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

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

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

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

W6.https://presiuniv.knimbus.com/user#/searchresultsearchId=eBook&curPage=0&layout=grid&sorFieldId=none&topresult=false&content=*cloud*

Topics relevant to development of "Foundation skill": Software Development Lifecycle

Topics relevant to development of "Employbility skills": Docker, Ansible, Jenkins

CSA3002- Machine Learning Algorithms

Course Code: CSA3002	**Course Title:** **MACHINE LEARNING ALGORITHMS** **Type of Course: Integrated**	**L- T- P- C**	**2**	**0**	**2**	**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. Machine learning algorithms can be categorized into several types based on their learning approach: 1. Supervised learning algorithms - Its learn from labeled examples, where each data instance is associated with a known target or output value. 2. Unsupervised learning algorithms - Its learn from unlabeled data, where there are no predefined output labels. 3. Semi-supervised learning algorithms - Its combine elements of supervised and unsupervised learning. They leverage a small amount of labelled data along with a larger amount of unlabeled data to improve learning performance Each machine learning algorithm has its own strengths, weaknesses, and assumptions. The choice of algorithm depends on the specific problem, the available data, and the desired outcome.						
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	5. **Knowledge** of training and testing the datasets using machine Learning techniques. 6. **Apply** optimization andparameter tuning techniques for machine Learning algorithms. 7. **Apply** a machine learning model to solve various problems using machine learning algorithms. 8. **Design**a 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 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**
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

3. **Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python" Wiley, First Edition 2019.**
4. **"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.**

Reference Books

8. "Machine Learning" by Tom Mitchell: This book covers the foundations of machine learning and explores various algorithms and methods. It provides a balanced mix of theory and practical applications and is often used as a textbook in introductory machine learning courses.

9. "The Elements of Statistical Learning" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman: This book focuses on statistical learning methods and covers a broad range of techniques, including linear regression, classification, tree-based methods, and ensemble methods. It provides a theoretical foundation along with practical insights.

10. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville: This book offers an in-depth exploration of deep learning methods, including deep neural networks, convolutional neural networks (CNNs), recurrent neural networks (RNNs), and generative models. It covers both theory and implementation details.

11. "Pattern Classification" by Richard O. Duda, Peter E. Hart, and David G. Stork: This classic textbook covers the fundamentals of pattern classification and machine learning algorithms. It provides a solid foundation in pattern recognition concepts and techniques and includes practical examples and applications.

12. "Understanding Machine Learning: From Theory to Algorithms" by Shai Shalev-Shwartz and Shai Ben-David: This book focuses on the theoretical aspects of machine learning, including formalism, generalization bounds, and algorithm design principles. It presents key machine learning concepts in a rigorous yet accessible manner.

Web References

6. https://nptel.ac.in/courses/
7. https://www.udemy.com/course/
8. https://www.coursera.org/learn/

Topics relevant to "SKILL DEVELOPMENT":

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

CSA3003- Android Mobile Application Development

Course Code: CSA3003	Android Mobile Application Development	**L- T-P- C**	1	0	4	3
Version No.	2.0					
Course Pre-requisites	The student needs to have fundamental understanding of object-oriented programming concepts with Java/C#, XML, usage of any integrated development environment.					
Anti-requisites	Nil					
Course Description	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. 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.					
Course Objective	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.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Discuss the fundamentals of mobile application development and architecture. [**Understand**] 2. Illustrate mobile applications with appropriate android view. [**Apply**] 3. Demonstrate the use of services, broadcast receiver, Notifications and content 4. Apply data persistence techniques, to perform CRUD operations. [**Apply**] 5. Use advanced concepts for mobile application development. [**Apply**]					
Course Content:						
Module 1	**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.						
Module 2	**User Interfaces, Intent and Fragments**	Assignment	Numerical from E-Resources	**15 Sessions**		
Views, Layout, Menu, Intent and Fragments.						
Module 3	**Components of Android**	Term paper/Assignment	Simulation/Data Analysis	**15 Sessions**		
Activities, Services, Broadcast receivers, Content providers, User Navigation						

Module 4	**Notifications and Data Persistence**	Term paper/Assignment	Simulation/Data Analysis	**15 Sessions**
Notification, Shared Preferences, SQLite database, Android Room with a View, Firebase				
Module 5	**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 toast message.

1.b. Create an android app to calculate the current age of yourself, select your DOB using date pick

2.a. Design an app to input your personal information. Use autocomplete text view to select your pl birth.

2.b. Design an app to select elective course using spinner view and on click of the display button, t 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 above 18, display the voter's detail in the second activity. Else, display, “You are not eligible to vot the second Activity.

5. Demonstrate the use of fragment with list of buttons representing various colors, and on click of 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 abn give proper notification to the user.

6. Create an android app to for movie ticket booking. Save the user name of the customer using sha preferences. After completion of booking, retrieve the username from the shared preferences and pr ticket details.

7. Create an android application to manage the details of students' database using SQLite.Use neces 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 y 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 DISPLAY ALL (full students list) on click on the button it should display the students list per the fe concession.

8. A company need to design an app that plays soft music automatically in the background. Create a to achieve this functionality.

9. Create an android application such that your view object in the Activity can be Animated with fa effect. Create an appropriate XML file named fade-in and write the application to perform the prop animation.

10. Demonstrate how to send SMS and email.

11. Create an android application to transfer a file using WiFi. Create an android application “Whe 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 Develoment", O'Reilly Media, 3rd edition 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),ScottGowell (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

1. Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3rd 2017.The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"
2. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd,
3. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Rei Publishers, 2015.
4. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley In Ltd, 2016. ISBN-13: 978-8126565580
5. Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014 978-81-265-4660-2
6. Reto Meier "Professional Android Application Development"

E-Resources

1. **https://developers.google.com/certification/associate-android-developer/study-guide/android-**
2. NPTEL course : https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
3. https://www.coursera.org/specializations/android-app-development
4. 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** techni
This is attained through the assessment component mentioned in the course handout.

CSA2010- Software Testing

<table>
<tr><td>Course Code:
CSA2010</td><td colspan="3">Course Title: Software Testing

Type of Course: Program Core & Theory and Laboratory Integrated</td><td>L-T-P-C</td><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">Software Engineering</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">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.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Software Testing and attain Employability through Experiential learning.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of the course the students shall be able to:
[1] Describe the fundamentals of software testing for Quality assurance. [Comprehension]
[2] Develop Test cases to test Applications / Software’s. [Comprehension]
[3] Write Bug reports found in Testing Applications / Software’s. [Application]</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Fundamentals of Software Testing</td><td>Quiz</td><td>Data Collection</td><td colspan="4">10 Sessions</td></tr>
<tr><td colspan="9">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).</td></tr>
<tr><td>Module 2</td><td colspan="2">Test Case Development and Execution</td><td>Case Study</td><td>Programming Task</td><td colspan="4">16 Sessions</td></tr>
<tr><td colspan="9">Test Cases – Identification of Test case Scenarios – Test Case Template – Writing Test cases for Problems –Test Case Execution and Examples for Lab Exercises.</td></tr>
<tr><td>Module 3</td><td colspan="2">Bug Reporting and Automation Testing</td><td>Assignment</td><td>Programming Task</td><td colspan="4">12 Sessions</td></tr>
<tr><td colspan="9">Defect Life Cycle, Bug Reporting – Template and Examples for Lab Exercises – Basics of Software Test Automation – Software Testing Metrics.</td></tr>
<tr><td colspan="9">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
1. Triangle problem: Boundary Value Testing (BVT) and Decision Table Testing (DTT)</td></tr>
</table>

2. Commission problem Boundary Value Testing (BVT) and Decision Table Testing (DTT)
3. Next-Date display problem: Boundary Value Testing (BVT) and Decision Table Testing (DTT)

Lab exercises on White Box Testing

4. Binary Search algorithm: control low graph, Cyclometic Complexity, Basis Path testing
5. Absolute Grading Procedure: control low graph, Cyclometic Complexity, Basis Path testing
6. Prime Number algorithm: control flow graph, Cyclometic Complexity, Basis Path testing

Targeted Application & Tools that can be used:

- 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

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

Text Books

T1. 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

T2. Srinivasan Desikan and Gopalaswamy Ramesh, *"Software Testing – Principles and Practices",* Pearson Education, 2016. http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6549

T3. 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

R1. Cem Kaner, Jack Falk, Hung Q. Nguyen, *"Testing Computer Software",* Second edition, Wiley 2015. https://www.pdfdrive.com/testing-computer-software-d8618500.html

R2. 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

R3. 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

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.

CSA3004- Big Data Analytics

Course Code: CSA3004	**Course Title:** BIG DATA ANALYTICS **Type of Course:** Program Core & Theory & Lab Integrated	**L-T-P- C**	**2**	**0**	**2**	**3**

Version No.		1.0
Course Pre-requisites		Knowledge of computer systems, programming and debugging, with a strong competency in at least one language (such as Java/Python / R), and the ability to pick up other languages as needed
Anti-requisites		*NA*
Course Description		The course's goal is to teach the principles of big data technology and to emphasise the significance of selecting appropriate tools for processing and analysing big data in order to acquire insights. The student should be able to select and apply the best big data tools to solve business problems. The related laboratory allows you to put the concepts into practise while also honing your critical thinking and analytical skills. With a solid understanding of the foundations of Big data technologies, students can obtain practical experience in implementing them, allowing them to be an effective solution provider for applications involving large amounts of data.
Course Objectives		The objective of the course is to familiarize the learners with the concepts of **Big Data Analytics** and attain **Skill Development** through**ExperiantialLearning** techniques.
Course Outcomes		On successful completion of the course the students shall be able to: • Apply Map-Reduce programming on the given datasets to extract required insights. (Application). • Employ appropriate Hadoop Ecosystem tools such as scoop, Hbase, Hive, to perform data analytics for a given problem. (Application). Use Spark tool to analyze the given dataset for a given problem. (Application).
Course Content:		

Module 1	**BIG DATA HADOOP & YARN**	Assignment			**10 Sessions**

Topics:

Introduction to Big Data and its importance: Basics of Distributed File System, Four Vs, Drivers for Big data, Big data applications, Structured, unstructured, semi-structured and quasi structured data. Big data Challenges-Traditional versus big data approach, The Big Data Technology Landscape: No-SQL.

The Hadoop: History of Hadoop-Hadoop use cases, The Design of HDFS, Blocks and replication management, Rack awareness, HDFS architecture, HDFS Federation, Name node and data node, Anatomy of File write. Anatomy of File read, Hadoop Map Reduce paradigm, Map and reduce tasks, Job Tracker and task tracker, Map reduce execution pipeline, Key value pair, Shuffle and

	sort, Combiner and Partitioner, APIs used to Write/Read files into/from Hadoop, Need for Flume and Sqoop. **Anatomy of a YARN:** Hadoop 2.0 Features, Name Node High Availability, YARN Architecture, Introduction to Schedulers, YARN scheduler policies, FIFO, Fair And Capacity scheduler.				
Module 2	**SQOOP AND HIVE**	Assignment			**10 Sessions**
	Topics: **Introduction to SQOOP**: SQOOP features, Sqoop Architecture, Sqoop Import All Tables, Sqoop Export All Tables, Sqoop Connectors, Sqoop Import from MySQL to HDFS, Sqoop vs flume. **Hive:** Apache Hive with Hive Installation, Hive Data Types, Hive Table partitioning, Hive DDL commands, Hive DML commands, and Hive sort by vs. order by, Hive Joining tables, Hive bucketing. **Hbase:** Introduction to HBase and its working architecture- Commands for creation and listing of tables- disabled and is disabled of table - enable and is enabled of table- describing and dropping of table-Put and Get command - delete and delete all command-commands for scan, count, truncate of tables.				
Module 3	**APACHE SPARK AND SPARK SQL**	Quiz			**10 Sessions**
	Introduction to Apache Spark A unified Spark, Who uses Spark and for what?, A Brief History of Spark, Spark version and releases, Storage layers for Spark. Programming with RDDs: RDD Basics, Creating RDDs, RDD Operations, Passing functions to Spark, Common Transformations and Actions, Persistence. Spark SQL: Linking with Spark SQL, Using Spark SQL in Applications, Loading and Saving Data, JDBC/ODBC Server, User-defined functions, Spark SQL Performance. Scala: The Basics, Control Structures and functions, Working with arrays, Maps and Tuples.				
	Targeted Application & Tools that can be used: • **Business Analytical Applications** • **Social media Data Analysis** • **Predictive Analytics** Hadoop , Cassandra , Spark , MongoDB, Strom , R Studio ,Tableau , Python				
	Project work/Assignment:				
	Assignment: 1. Big Data Analytics – Industrial Use Cases 2. Big Data Analytics for Finance 3. Big Data Analytics for Health Care **Programing Task :** **List of Laboratory Tasks:** 1.**Level 1:** To install the Hadoop in pseudo cluster mode. **Level 1:** HDFS Shell Commands – Files and Folders. **Level 2:** HDFS Shell Commands – Management. 2. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm. **Level 1:** Find the number of occurrence of each word appearing in the input file(s)				

Level 2: Performing a Map Reduce Job for word search count (look for specific keywords in a file).

3. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with Map Reduce, since it is record-oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.

Level 1: Find average, max and min temperature for each year in NCDC data set?
Level 2: Programming assignment to analyze the social media data for business analytics.

4. **Level 1:** Finding out Number of Products Sold in Each Country using map reduce with sample dataset
Level 2: Find matrix multiplication using map reduce

5. **Level 1:** Installation of Hive, working on basic hive commands. (Create, Alter and Drop tables)
Level 2: Apply Hive commands to student database/employee database.

6. **Level 1:** Working on advance hive commands. (Static Partitioning & Dynamic partitioning)
Level 2: Continue the previous experiment, select and apply suitable partitioning technique.

7. **Level 1:** Working on advance hive commands-2. (Bucketing)
Level 2: Continue the previous experiment, apply bucketing technique to bring out the difference between partitioning and bucketing.

8. **Level 1:** Installing Ecosystem tools such as Scoop, Hbase.
Level 2: Scoop – Move Data into Hadoop.

9. **Level 1:** Working on basic Hbase commands (General commands, DDL Commands)
Level 2: Apply Hbase commands on Insurance database/employee dataset.

10. **Level 1:** Working on advanced Hbase commands. (DML).
Level 2: Continue the previous experiment to demonstrate CRUD operations.

11. **Level 1:** Install, Deploy & configure Apache Spark.
Level 2: Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark

12. **Level 1:** Write a program in Apache spark to count the occurrences words in a given text file and display only those words starting with 'a' in ascending order of count.
Level 2: Apache access logs are responsible for recording data for all web page requests processed by the Apache server. An access log record written in the Common Log Format will look something like this: 127.0.0.1 - Scott [10/Dec/2019:13:55:36 – 0700] "GET /server-status HTTP/1.1" 200 2326 Where, HTTP 200 status response code indicates that the request has succeeded. Write a program to read the records of access log file log.txt and display the number of successful requests using Spark.

13. **Level 1:**Chess king moves horizontally, vertically or diagonally to any adjacent cell. Given two different cells of the chessboard, determine whether a king can go from the first cell to the second in one move.
Write a scala program that receives input of four numbers from 1 to 8, each specifying the column and row number, first two - for the first cell, and then the last

two - for the second cell. The program should output YES if a king can go from the first cell to the second in one move, or NO otherwise.

Level 2: Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Write a single Spark application that:

- Transposes the original Amazon food dataset, obtaining a Pair RDD of the type:
- Counts the frequencies of all the pairs of products reviewed together;

Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Text Books

[T1] Big Data: Concepts, Technology, and Architecture , NandhiniAbirami R, SeifedineKadryAmir H. Gandomi, BalamuruganBalusamy, Wiley , 2021

[T2] Seema Acharya, SubhashiniChellappan. 2015. *Big Data and Analytics*. Wiley Publication.MateiZaharia, Bill Chambers. 2018. *SPARK: The Definitive Guide*. Oreilly.

References Books

[R1] Kristina Chodorow, "MongoDB: The Definitive Guide – Powerful and Scalable Data Storage", O'Reilly, 3rd Edition, 2019.

[R2] Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013

[R3] Hadoop: The Definitive Guide, Tom White ,Third Edition, O'Reilley, 2012.

[R4] Programming Hive, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012

[R5] HBase: The Definitive Guide, Lars George, O'Reilley, 2011.

[R6] Cassandra: The Definitive Guide, Eben Hewitt, O'Reilley, 2010.

[R7] Programming Pig, Alan Gates, O'Reilley, 2011.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://www.classcentral.com/course/bigdata-analytics-4216
3. https://www.edx.org/course/big-data-analytics-2
4. https://www.futurelearn.com/courses/applied-big-data-analytics
5. **https://www.udemy.com/course/big-data-complete-course/**

Topics relevant to "SKILL DEVELOPMENT":

Distributed File Systems, Scoop Architecture for **Skill development** through **Experiential Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

CSA3005- Internet of Things

Course Code: CSA3005	**Course Title: Internet of Things** **Type of Course: Integrated**	**L- T-P-C**	**1**	**0**	**4**	**3**
Version No.	1.0					
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 **Employability** through **Experiential Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: **1.** Identify the application areas of IoT **2.** Understand building blocks of Internet of Things and characteristics **3.** Describe IoT Protocols **4.** Demonstrate use of IoT devices for simple application					
Course Content:						
Module 1	INTRODUCTION TO INTERNET OF THINGS	Assignment	Simulation/Data Analysis	**18 Sessions**		
Introduction, Definition & Characteristics of IOT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical design of IoT- IoT functional blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies- Wireless sensor networks, Cloud computing, Big data Analytics						
Module 2	IOT COMMUNICATION MODEL AND PROTOCOLS	Assignment	Numerical from E-Resources	**18 Sessions**		
Connectivity Protocols: 6LoWPAN, IEEE 802.15.4, Zigbee, Wireless HART, Z-Wave, ISA 100,NFC, RFID. Communication/Transport Protocols: Bluetooth. Data Protocols: Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Advanced Message Queuing Protocol (AMQP), XMPP – Extensible Messaging and Presence Protocol						
Module 3	IOT COMMUNICATION MODEL AND PROTOCOLS	Term paper/Assignment	Simulation/Data Analysis	**19 Sessions**		

Communication/Transport Protocols: Bluetooth. Data Protocols: Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Advanced Message Queuing Protocol (AMQP), XMPP – Extensible Messaging and Presence Protocol. RFID: Introduction, Principle of RFID, Components of an RFID system.

List of Laboratory Tasks

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 potentio meter
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 and Raspberry pi for developing smart CITIES

Tools:

Tinker cad
Cooja simulator
Contiki
Thingspeak

Assignment:

Mini Project will be there in place of Assignment

Text Book

T1 Arshdeep Bagha, Vijay Madisetti, Internet of Things A hands on approach, First Edition, Universities
Press, 2018
T2 Hakima Chaouchi, The internet of Things Connecting Objects to web Wiley 2017

References

R1 Vinit Kumar Gunjan, MohdDilshad Ansari,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

E-Resources

NPTEL course –
a) 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 "EMPLOYABILITY SKILLS": Principle of RFID, Components of an RFID system for developing **Employability Skills through Experiential Learning techniques.** This is attained through assessment component mentioned in course handout.

CSA3006-Blockchain Technology

Course Code: CSA3006	**Course Title: Blockchain Technology Type of Course: Discipline Elective**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	Fundamentals of Blockchain Technology					
Anti-requisites	NIL					
Course Description	The purpose of the course is to provide an introduction to Blockchain technology with specific focus on industrial applications like Blockchain in Financial system, trade/supply chain management, agriculture industry, Healthcare sectors and Insurance system. With the knowledge of blockchain technology, Students will learn how these systems are built, how to interact with them.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **Blockchain Technology and Applications and** attain **Skill Development** through **Problem solving methodologies.**					
Course Out Comes	On successful completion of this course the students shall be able to: 1. Understand the concepts of Blockchain technology (Knowledge). 2. Explain the methods for verification and validation of Bitcoin transactions (Comprehension). 3. Explore the use the Ethereum programming (Application). 4. Illustrate the role of blockchain in various domain (Comprehension).					
Course Content:						
Module 1	**Introduction to Blockchain**	**Quiz**	**Knowledge based quiz on** Cryptographic Hash Functions	**No. of Classes:10**		
Topics: Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Online Wallets and Exchanges, Payment Services, Transaction Fees, Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures.						
Module 2	**Bitcoin**	**Assignment**	**Bitcoin mining pools**	**No. of Classes:10**		
Bitcoin Mechanics: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements. Bitcoin mining: The task of Bitcoin miners, Mining Hardware, Energy consumption, Mining pools, Mining incentives and strategies**.**						
Module 3	**Ethereum**	**Create a smart contract using solidity language**	**Components of Ethereum Ecosystem**	**No. of Classes:15**		
The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.						

Module 4	Blockchains in Business	Case Study	Conduct a case study on how BaaS is adopted in industries.	No. of Classes:10

Topics: Blockchain in Supply Chain - Blockchain in Manufacturing - Blockchain in Automobiles - Blockchain in Healthcare- Blockchain in Financial Industry

List of Laboratory Tasks: NA

Targeted Application & Tools that can be used:

- Etherum Remix online & Ganache
- Solidity programming language for **Skill Development** through **Participative Learning** techniques. This is attained through assessment component mentioned in course handout.

1. Calculate the 'number of ethers' for the transaction of gas limit for the scenario in which the sender sets the gas limit to 50,000 and a gas price to 20 gwei.
2. Represent the Ethereum Merkley Tree for the given list of Transactions.
3. Create Survey report of various types of Blockchain and its real time use cases.

Textbook(s):

1. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.

References:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd, March 2018.

Weblinks:

- Udemy: https://www.udemy.com/course/build-your-blockchain-az/
- NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#

https://www.google.co.in/books/edition/Blockchain_By_Example/ci59DwAAQBAJ?hl=en&gbpv=1

Topics relevant to "SKILL DEVELOPMENT": Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts for **Skill Development through Problem solving methodologies. This is attained through the assessment component mentioned in the course handout.**

CSA3007- Data Analytics and Business Intelligence

<table>
<tr><td>Course Code:
CSA3007</td><td colspan="5">Course Title: Data Analytics and Business Intelligence

Type of Course: Program Core Laboratory Integrated Course</td><td>L-T-P-C</td><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="10">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="10">Basics of Python Programming and simple database concepts.</td></tr>
<tr><td>Anti-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Course Description</td><td colspan="10">This is an introductory course to data science and it covers the mathematical foundations of data science, techniques for data collection, pre-processing and visualizing data. Concepts discussed in this course will be supplemented with hands on data science tools in Data Science Lab course.This course also enables students to learn and understand the fundamentals of Business Intelligence and also Describes how Data Integration is achieved using SSIS.

Topics: Introduction to Data Analysis – Getting Data – Web scrapping – Pre-processing data – Cleaning – Munging – Manipulation – Rescaling and dimensionality reduction – Visualizing data – Histograms – Line charts – Pie charts – Multiple bar graphs – Box plots and Scatter plots. Business Intelligence – Data Warehouse – ETL – SSIS</td></tr>
<tr><td>Course Objective</td><td colspan="10">The objective of the course is to familiarize the learners with the concepts of Data Analytics and Business Intelligence and attain Skill Development through Experiential Learning techniques.

.</td></tr>
<tr><td>Course Out Comes</td><td colspan="10">On successful completion of the course the students shall be able to:

C.O.1: Describe the fundamentals of Data Analysis and Business Intelligence Technologies. (Knowledge)
C.O.2: Implement data visualization techniques to analyze Datasets. (Application)
C.O.3: Apply ETL tools to integrate data in a warehouse. (Application)</td></tr>
<tr><td>Course Content:</td><td colspan="10"></td></tr>
<tr><td>Module 1</td><td>Introduction to Data Analysis and Visualization</td><td>Assignment</td><td>Programming Task</td><td>10 Sessions</td></tr>
<tr><td colspan="11">Topics:
Introduction to Data Analysis – Python Libraries for Data analysis – Data-types of variables – Continuous and Discrete variables – Data sampling – Pandas Data Structures – Data Visualization – Matplotlib Histograms – Line charts – Pie charts – Multiple bar graphs – Box plots – Scatter plots – Sea born plots – Bokeh plots.</td></tr>
</table>

Module 2	Data collection	Assignment		**15 Sessions**
Topics: Data Collection – Data Cleaning – Data munging – Web Scrapping – Rescaling and Dimensionality Reduction – Feature Selection – Feature Extraction – Principal Component Analysis.				
Module 3	Introduction to Business Intelligence	Assignment		**20 Sessions**
Topics: Types of digital data – Introduction to OLTP – OLAP and Data Mining. BI Definitions & Concepts – Business Applications of BI – BI Framework – Role of Data Warehousing in BI.				
Module 4	Classification and clustering	Assignment		**15 Sessions**
Decision tree Induction – Bayesian classification – Model evaluation and selection techniques to improve classification accuracy. Clustering Analysis – portioning method – Hierarchical methods				
Targeted Application & Tools that can be used: Applications in Systems containing Multi-Force Members, Frames, Trusses, Machines, Cable Bridges etc. **Professionally used softwa**re – Staad Pro/ETABS				
Project work/Assignment:				
To understand the application of the forces on rigid bodies, the students should draw the free body diagrams and calculate the magnitudes and directions of forces acting on the body. Assignment: 1] Determine the resultants for the Problems using MATLAB functions Assignment: 2] Determine the support reactions for the beams using MS Excel based on the given data.				
Text Book T1. 1. Wes Mckinney. *"Python for Data analysis",* Second Edition, O'Reilly USA, 2017. T2. 2. RN Prasad and Seema Acharya*, "Fundamentals of Business Analytics"*, First Edition, Wiley India 2016. https://presiuniv.knimbus.com/user#/home https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehostlive				
References R1. Roger Peng, *"Exploratory Data Analysis"*, Lean Publications, 2015. R2. Soraya Sedkaoui, Mounia Khelfaoui, *"Sharing Economy and Big Data Analytics"*, First Edition, 2020. R3. Rick Sherman , *"Business Intelligence Guidebook: From Data Integration to Analytics",2014*				
Topics relevant to "SKILL DEVELOPMENT": Data Visualization – Matplotlib Histograms – Line charts – Pie charts – Multiple bar graphs – Box plots – Scatter plots – Sea born plots – Bokeh plots **for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.**				

Discipline Electives

CSA3022 – Advanced Java

Course Code: CSA3022	**Course Title: Advanced Java** **Type of Course:1] School Core** **2] Laboratory integrated**	**L-T- P- C**	**1**	**0**	**4**	**3**
Version No.	1.0					
Course Pre-requisites	**OOPS using Java**					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to introduce the students to Java Advanced API enhanced by Design Patterns and SOLID Principles. The course is both conceptual and analytical and is understood with JDK 8 software & IntelliJ IDE. This course develops critical thinking skills by augmenting the student's ability to develop distributed model for control of various modern management systems like banking management system, student information management system, , Library Management System etc. w*ith* the necessary API for communication with database enhanced by the current industrial approach of Java's SOLID principle and design patterns. This course also involves essential core java concepts like multithreading, file handling, event handling etc.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **Advanced Java Programming** and attain **Employability** through E**xperiential Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1] Explain the benefits of Design-Pattern & SOLID principle in java based applications. 2] Understand Concurrent Programming using Java Multi-Threading. 3] Apply Communication mechanisms of Java with DBMS. 4] Implement Web MVC application using Servlet and JSP Technology. 5] Test JPA Implementation using Hibernate.					
Course Content:						
Module 1	Multi-Threading (Comprehension)	Assignment	Knowledge Ability	**10 sessions**		
Topics:						

Multi-Threading in Java: Understanding Threads , Needs of Multi-Threaded Programming ,Thread Life-Cycle, Thread Priorities ,Synchronizing Threads, Inter Communication of Threads ,Critical Factor in Thread –DeadLock, The Executor Framework.				
Module 2	Input & Output Operation in Java (Comprehension)	Assignment	File Operations	**10 sessions**
Topics **Java I/O Operations :** Input/Output Operation in Java(java.io Package),Streams and the new I/O Capabilities ,Understanding Streams, Working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
Module 3	Collection and Database programming using JDBC (Comprehension)	Assignment	Data Storage	**10 sessions**
Topics: **Collection -** The Collection Framework : Collections of Objects , Collection Types, Sets , Sequence, Map, Understanding Hashing, Uses of ArrayList & Vector , Comparable and Comparator Interfaces. **Database Programming using JDBC**- Introduction to JDBC, JDBC Drivers & Architecture, CRUD operation Using JDBC, Connecting to non-conventional Databases.				
Module 4	Distributed Programming with Servlet (Application)	Assignment	stributed Programming	**10 sessions**
Topics: **Servlet -** Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Create and compile servlet source code, start tomcat, start a web browser and request the servlet, servlet API, Handling HTTP Requests and Responses: Handling HTTP GET requests and POST request, Session Tracking, Simple Servlet Program to fetch database records				
Module 5	Distributed Programming with JSP (Application), Introduction to Spring Framework (Application)	Assignment	Distributed Programming	**5 sessions**

Topics:

JSP - Introduction to JSP, Creating simple JSP Programs, How JSP is processed, JSP Scripting Constructs, Predefined Variables, JSP Directives, Simple JSP Program to fetch database records.

Spring CORE, Overview of Spring, Spring Architecture, bean life cycle, Java and XML Configuration on Spring, Spring Different Modules.

Spring JPA, JPA Specification, Classes and Interfaces, Object Relational Mapping using JPA, JPA implementation with Hibernate, Simple JPA-Hibernate program to Create Database schemas.

List of Laboratory Tasks:

Labsheet -1 [4 + 1 Practical Sessions]

Experiment No 1:

Level 1: Demonstration of Thread Class and Runnable Interface.

Level 2 – Implementation of Producer-Consumer Problem.

Labsheet -2 [3 +1 Practical Sessions]

Experiment No. 1:

Level 1 – Usages of Java.io.* package.

Level 2 – File operations with a case study.

Labsheet – 3 [3 +1 Practical Sessions]

Experiment No. 1:

Level 1 – Practicing classes and methods in java.util.collection.

Level 2 – Scenario based questions to apply all collections. [Group wise]

Labsheet – 4 [3 + 1 Practical Sessions]

Experiment No. 1:

Level 1 – JDBC complete Demonstration with Student Database

Level 2 – Implementation of Student Information Management (Standalone). [Group wise]

Labsheet – 5 [3 + 1 Practical Sessions]

Experiment No. 1:

Level 1 – Web page creation using HTML, Dynamic web page using java.servlet and JDBC

Level 2 – Implementation of Student Information Management (WEB based). [Group wise]

Labsheet – 6 [3 + 1 Practical Sessions]

Experiment No. 1:

Level 1 – Web page creation using HTML, Dynamic web page using java.servlet , JSP and JDBC

Level 2 – Implementation of Student Database using JPA Hibernat

Build a Standalone database application using Java Swing as Front End. Indicative areas include; TimeTable Management, Student Expense Tracker, Important Mail Fetcher, etc.

Build a real time database application using J2EE as Front End. Indicative areas include; health care, education, industry, Library, Transport and supply chain, etc.

Text Books

1] Cay S Horstmann and Gary Cornell, "CORE JAVA volume II-Advanced Features, 9th Edition.

References

1] Herbert Schildt, *"Java 2: The Complete Reference"*, Tata McGraw-Hill Education,6th Edition.

2] Y.Daniel Liang, "Introduction to Java programming Comprehensive Version", Pearson Education, 10th Edition.

3] Core and Advanced Java Black Book, Dream Tech Press.

4] Spring in Action , Graig Walls, 5th Edition

5] Java Persistence with Hibernate , Christian Bauer & Gavin King, 2nd Edition

6] https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uTWA&index=2

Topics relevant to "Employability": Create and compile servlet source code, start tomcat, start a web browser and request the servlet **for Employobility through Experiential Learning techniques. This is attained through assessment component mentioned in course handout**

CSA3035 Image processing

Course Code: UG COURSE: CSA3035	**Course Title: Image processing** **Type of Course: Discipline Elective:**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	[1] **Linear Algebra and Calculus** (MAT1001), [2] **Transformation Techniques, PDE and their Applications** (MAT1002).					
Anti-requisites	NIL					
Course Description	This course includes Fundamentals, Applications, Human Visual Perception, Image Formation, Sampling and Quantization, Binary Image, Three-Dimensional Imaging, Image file formats. Color and Color Imagery: Perception of Colors, Image Transformation: Fourier Transforms, Image Enhancement and Restoration , Image Reconstruction, Image Segmentation. This Course is an introduction to image processing and image analysis techniques and concepts. Image processing has found much wider applications not only in the space program, but also in the areas such as medicine, biology, industrial automation, astronomy, law enforcement, defense, intelligence. With the progress made in multimedia these days, digital image processing has become an indispensable part of our digital age.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Image processing** and attain **Employability Skills** through E**xperiential Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. **Explain** the fundamentals of digital image and its processing. 2. **Apply** image enhancement techniques in spatial and frequency domain on low contrast images. 3. **Illustrate** the mathematical modeling of image degradation and restoration. 4. **Implement** image segmentation algorithms on real-time images.					
Course Content:						
Module 1	**Digital Image Fundamentals**	Assignment	Practical	**No. of Classes:4**		
Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Classification of images, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.						
Module 2	**Image Transformation**:	Assignment	Practical	**No. of Classes:8**		

Image enhancement in spatial domain: Some basic gray level transformations, Histogram processing, Smoothing and Sharpening spatial filters. **Image enhancement in frequency domain:** 1D FFT, 2D FFT, Smoothing and Sharpening frequency domain filters, Homomorphic filtering.				
Module 3	**Image Restoration**	Assignment	Practical	**No. of Classes:8**
A model of the image restoration and degradation process**,** Noise models – spatial and frequency properties of noise, some important probability density functions: Gaussian noise, Rayleigh noise, Gamma noise, exponential, uniform, impulse noise, Periodic noise Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering.				
Module 4	**Image Segmentation**	Assignment	Practical	**No. of Classes:10**
Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, **Color image processing:** Color Fundamentals, Color Models, Pseudo color Image Processing. **Morphological Image Processing:** Preliminaries, Erosion and Dilation, Opening and Closing, Some Basic Morphological Algorithms.				
Text Books 1. Rafael C. Gonzalez and Richard E. Woods' "Digital Image Processing", Fourth Edition, Global Edition 2018.				
References 1. Ravishankar Chityala, Sridevi Pudipeddi, "Image Processing and Acquisition Using Python", Taylor & Francis, 2020. 2. Jason M. Kinser, "Image Operators: Image Processing in Python", CRC Press, 2018. 3. TinkuAcharya and Ajoy K. Ray, "Image Processing Principles and Applications", John Wiley and Sons publishers.				
Topics relevant to "EMPLOYABILITY SKILLS": Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation for developing **Employability Skills** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.				

CSA3023 – Advanced Databases

Course Code: CSA3023	**Course Title:** Advanced Databases **Type of Course:** Discipline Elective	**L-T-P-C**	2	0	2	3
Version No.						
Course Pre-requisites	**[1] Database Management System (CSA2003)** **Basics of DBMS, like, File System and its drawbacks, Database Approach, 3-Schema Architecture and its concepts, Relational Algebra, Normalization, Transactions and its concepts, Backup and Recovery. In laboratory MySQL database skills are learnt.**					
Anti-requisites	L					
Course Description	**The purpose of this course is to make the students to revisit RDBMS transactions first. Then introduce them with Distributed, Parallel, and NoSQL database concepts. They include main characteristics, advantages and dis-advantages of each one of them. Importance and differences among them are noted. Need to transit from RBMS to NoSQL isdiscussed. The striking features of distributed, parallel and NoSQL are considered and studied.** **The associated laboratory provides an opportunity to have hands on of the concepts learned during this course.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Advanced DBMS** and attain **Employability Skills** through E**xperiential Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** (1) Recall the transactions in RDMS **(2)** Explain advanced features of distributed, parallel, and NoSQL databases. **(3)** Illustrate the features in Distributed database **(4)** Employ Paralleldatabase concepts in real life applications.					
Course Content:						
Module 1	**Transactions in RDBMS**	Quiz	Comprehension based Quizzes and assignments.	**25 Classes**		
Topics: RDBMS -Transaction control state diagram, ACID properties of transaction, Schedules in transactions - Serial, Non-Serial and Serializable, Serializability-Conflict and View, Conflict						

Serializability check by Precedency Graph, Concurrency Control – Lock Based and Time Stamp Based.

Module 2	**SQL Databases**	Programming and Mini Project	Laboratory experiments and Mini Projects on NoSQL Topics using MongoDB/ Casandra.	**25 Classes**

Topics:

NoSQL Introduction – Scale Out, Commodity Hardware, Brief History, Features – Non-Relational, Schema Free, Simple API, and Distributed. NoSQL Architectures/Data Models - Document, Columnar, Key-Value, and Graph. Transaction in NoSQL- BASE for reliable database transactions, Achieving Horizontal Scalability with Database Sharding,CAP theorem.

Case Study: MongoDB/Casandra/ AWS/ HBase

Module 3	**Distributed Databases**	Assignment	Assignment on main topics of Distributed Databases	**10 Classes**

Topics:

Loosely Coupled, Characteristics of Distributed Databases, Local and Global view of applications, Distributed Processing, Types – Homogeneous and Heterogeneous, Distributed Data Storage – Replication and Fragmentation, Fragmentation – Horizontal and Vertical Type, Difference between Centralized and Distributed Databases.

Module 4	Parallel Databases	Assignment	Assignment on main topics of Parallel Databases	**06 Classes**

Topics:

Tightly Coupled, Features of parallel databases, Shared Memory, Shared Disk, Shared Nothing Systems. Advantages of each of these schemes, Advantages and Disadvantages of Parallel Databases, Differences between Parallel and Distributed Databases.

Install MONGODB

https://www.javatpoint.com/mongodb-create-database

Create any one of the following databases.

Employee, Student, University, Banking, or Online Shopping

Drop database

Create Collection: In MongoDB db.createCollection(name,option) is used to create collection.

Drop Collection

List of Laboratory Tasks:(7 X 2= 14 Sessions)

Level 1: Perform CRUD operations (Insert, Update, Delete and Query Documents) on 'Student' Database.

Level 2: Do MongoDB text search on 'Employee' Database.

Experiment No. 2: Try experiments on MongoDB Operators

Level 1: Perform queries involving MongoDB Query and Projection Operators using 'Student' Database.

Level 2: Do queries involving MongoDB update operator on 'Employee' Database.

Experiment No. 3:Explore different query modifiers.

Level 1: Perform different query modifiers on 'Student' Database.

Level 2: Try various query modifiers on 'Employee' Database.

Experiment No. 4:Explore Aggregation commands.

Level 1: Implement different aggregation commands on 'Student' Database.

Level2: Perform various aggregation commands on 'Employee' Database.

Experiment No. 5:Explore Authentication commands.

Level 1: Try authentication commands on 'Student' Database.

Level 2: NA

Experiment No. 6:Explore Replication Commands

Level 1: Try all replication commands on 'Student' Database.

Level2: Implement replication commands on 'Employee' Database.

Experiment No.7:Try Sharding Commands.

Level1: Explore Sharding Commands on 'Student' Database.

Level 2: Implement Sharding Commands on 'Employee' Database.

Targeted Application & Tools that can be used:

MongoDB is to be installed and used.

Project work/Assignment:

Each batch of students (self-selected batch mates) will identify projects, such as, Library, Banking, and Reservation etc.,and do it. Concepts of NoSQL, like, CRUD operations, Supporting ad hoc queries, Indexing flexibility, Assisting replication, Creating capped collections, and Retrieving data from multiple documents.

Sample Mini Projects:

1. Content Management System

Clubbing the content assets like text and HTML into a single database helps provide a better user experience. MongoDB has an excellent toolset not only for storing and indexing but also for controlling the structure of a content management system. You can easily design a web-based CMS by using the model proposed by "Metadata and Asset Management" in MongoDB. Additionally, you can use "Storing Comments" to model user comments on blog posts.

2. Gaming Project

Data is an essential part of making video games work. Some typical examples of gaming data include player profiles, matchmaking, telemetry, and leaderboards.

The common thread between all games is that they all have a specific goal. And you have to achieve multiple objectives or pay your way out to reach the end goal. This may involve steps like watering your plants, growing vegetables, serving food in a restaurant, and so on.

Textbook(s):

1. **Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, 1st Edition, 2019(Wiley Publications).**
2. **Stefano Ceri, Giuseppe Pelagatti , Distributed Databases: Principles and Systems,, 2017(McGraw Hill Education).**

References

1. **Elmasri R and Navathe S B, "Fundamentals of Database System",7th Edition, 2017(Pearson Publication).**
2. **Pivert. *NoSQL Data Models: Trends and Challenges*, 1st edition(Wiley).**

Topics relevant to "EMPLOYABILITY SKILLS": Non-Relational, Schema Free, Simple API, and Distributed. NoSQL Architectures/Data Models - Document, Columnar, Key-Value, and Graph. Transaction in NoSQL- BASE for reliable database transactions**fordeveloping Employability Skills** through **Experiential Learning techniques.** This is attained through assessmentcomponent mentioned in course handout.

CSA3024 – Advanced Python

Course Code: **CSA3024**	**Course Title:** **ADVANCE PYTHON** **Type of Course: Elective**	**L-T- P- C**	**1**	**0**	**4**	**3**
Version No.						
Course Pre-requisites	**Nil**					
Anti-requisites						
Course Description	The advanced Python course covers a wide range of topics and skills to enhance your proficiency in Python programming. Throughout the course, you will delve into advanced concepts such as neural networks, web scraping, data analysis, building RESTful APIs, natural language processing, image processing, and data visualization. By completing this course, student will have a solid understanding of advanced Python techniques and be well-equipped to tackle complex programming tasks, analyze data, build applications, and work on projects in various domains.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Advance Python and attain **Skill Development** through E**xperiential Learning** techniques.					
Course Outcomes	9. **Knowledge** of training and testing the datasets using machine Learning techniques. 10. **Design** a models through machine learning algorithm. 11. **Apply** optimization and parameter tuning techniques for machine Learning algorithms. 12. **Apply** a machine learning model to solve various problems using machine learning algorithms.					
ourse Content:						
Module 1	**roduction to Advanced Python Concepts**	Assignment		**4 Sessions**		
Topics: A. Recap of Python basics and syntax B. Introduction to advanced data structures and libraries (NumPy, Pandas, etc.) C. Overview of object-oriented programming (OOP) concepts and principles						
Module 2		Assignment		**5 Sessions**		

	Neural Networks and Deep Learning			
Topic: A. Introduction to neural networks and their architecture B. Understanding activation functions, backpropagation, and gradient descent C. Exploring deep learning frameworks like TensorFlow or PyTorch				
Module 3	**Web Scraping and Data Analysis**	Case Study		**8 Sessions**
Topics: A.Introduction to web scraping and HTML parsing B.Working with web scraping libraries (BeautifulSoup, Scrapy) C.Data cleaning, manipulation, and analysis using Pandas				
Module 4	**Building RESTful APIs**	Case Study and Project		**13 Sessions**
Topics: A. Understanding the principles of REST and API design B. Building APIs with Flask or Django frameworks C. Handling authentication, request/response formats, and error handling				
Module 4	**Natural Language Processing (NLP)**	se Study and Project		
Topics: A. Introduction to NLP and its applications B. Text preprocessing techniques (tokenization, stemming, etc.) C. Text classification, sentiment analysis, and named entity recognition				
Module 5	**Image Processing and Computer Vision**	se Study and Project		
Topics: A. Overview of image processing techniques (filters, transformations, etc.) B. Introduction to computer vision libraries (OpenCV) C. Object detection and image recognition algorithms				
Module 6	**Data Visualization with Interactive Dashboards**			
Topics: A. Introduction to data visualization principles and best practices B. Creating interactive visualizations with Plotly or Bokeh C. Building interactive dashboards for data exploration				

Basics: Use UCI repository and Kaggle dataset for each experiments. Introduction to Python Stack for Data Science, Core Python Libraries for data analysis, Anaconda platform and its installation, Executing programs on Jupiter IDE.

Experiment 1

Implementation of a Neural Network:

L1-Build a neural network from scratch using NumPy or TensorFlow.

L2- Train the network on a dataset and evaluate its performance.

Experiment 2

Web Scraping and Data Analysis:

L1- Scrape data from a website using libraries like BeautifulSoup or Scrapy.,

L2-Perform data analysis and visualization on the scraped data using Pandas and Matplotlib.

Experiment 3:

Building a RESTful API:

L1-Create a RESTful API using a web framework like Flask or Django.

L2-Implement CRUD (Create, Read, Update, Delete) operations for a specific resource.

Experiment 4

Natural Language Processing (NLP) Project:

L1- Develop a text classification or sentiment analysis model using NLP libraries like NLTK or spaCy

L2- .Apply the model to analyze text data and extract meaningful insights.

Experiment 5

Image Processing and Computer Vision:

L1- Implement image processing techniques such as edge detection, image filtering, or object detection using libraries like OpenCV.

L2- Build a simple image recognition system using machine learning algorithms.

Experiment 6

Data Visualization with Interactive Dashboards:

L1- Create interactive dashboards using libraries like Plotly or Bokeh.

L2- Visualize data in various formats (e.g., charts, maps) and add interactive features for exploration.

Text Books

5. **Manaranjan Pradhan, U Dinesh Kumar, “Machine Learning Using Python” Wiley, First Edition 2019.**
6. **Fluent Python, 2nd Edition Released April 2022, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492056355**
7. **Python Cookbook" by David Beazley and Brian K. Jones**

Reference Books

1. "Python for Data Analysis" by Wes McKinney
2. Deep Learning with Python" by François Chollet

3. "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper

4. Python Web Scraping - Second Edition" by Katharine Jarmul and Richard Lawson

5. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

6. Python Concurrency in Action" by Rob Piper

7. High Performance Python" by Micha Gorelick and Ian Ozsvald

8. Data Visualization with Python and JavaScript" by Kyran Dale

Web ssssReferences

9. **https://nptel.ac.in/courses/**
10. **https://www.udemy.com/course/**
11. **https://www.coursera.org/learn/**

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	Nil					
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		**7 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		**10 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**	

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, 8th 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.3rd Edition, 2014

R3. AtulKahate, "*Cryptography and Network Security*", Tata McGraw-Hill, 2nd 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

Web resources:

1. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ
2. 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. T**his is attained through assessment component mentioned in course handout..

CSA3028- Embedded Systems

Course Code: CSA3028	**Course Title: Embedded Systems** **Type of Course: Discipline Elective**	**L- T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	Before attempting this course the student should have prior knowledge of Comparison between microprocessors and microcontrollers, Instruction set of microprocessors and microcontrollers, Real world interfacing, Embedded C programming.					
Anti-requisites	**NIL**					
Course Description	The course provides insights into the fundamentals of Embedded Systems and their design using ARM microcontrollers. This course demonstrates System design examples and case studies for real-world applications. This course also gives brief introduction of Embedded Real Time Operating System (RTOS).					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **Embedded Systems** and attain **Employability Skills** through **Participative Learning** techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 5] Describe Embedded Systems and their Interfacing to the Analogue world 6] Distinguish between various ARM architecture versions 7] Program ARM processors using Assembly and C Languages 8] Understand the concept of Real Time Operating systems					
Course Content:						
Module 1	Fundamentals of Embedded Systems	Assignment	Programming activity	**9 Hours**		
Topics: What is an Embedded System?, Inside the Embedded System, Embedded Processors, Memory Systems, Basic Peripherals, Interfacing to the Analogue world, Interrupts and Exceptions.						
Module 2	ARM Architecture	Assignment	Programming activity	**12 Hours**		
Topics: Introduction to ARM® and ARM® Architecture, Cortex™-M TM4C123X processor, Comparing ARM® Cortex™-M TM4C123X processor with LPC21xx architecture, ARM and Thumb Instruction Set Overview, ARM Addressing Modes, ARM Assembly Programming.						
Module 3	ARM Programming and Interfacing	Assignment	Programming activity	**12 Hours**		

Topics:

Embedded C Programming– Conditional Statements, Loop Statements, debugging, single stepping, breakpoints, Concepts of Input and Output Ports, Basics of Interfacing Switches and LEDs, Interfacing Stepper Motors and DC Motors, Serial Communication, USB, RS232, CAN BUS, MOD BUS, I2C.

Module 4	Real Time Operating Systems (RTOS)	Assignment	Programming activity	**12 Hours**

Topics:

Introduction to Embedded Real Time Operating Systems (RTOS), Types of RTOS, Architecture of Embedded RTOS, Kernel in RTOS, Overview of various systems:- MicroC/OS-II, VX Works, RTLinux, Free RTOS, Differences in operating systems.

Targeted Application & Tools that can be used: Editor: A text editor is the first tool you need to begin creating an embedded system, Compiler, Source code is written in a high-level programming language, Assembler, Debugger, Linker, Emulator, Integrated Development Environment (IDE), PyCharm.

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

7] Problem Solving: Choose an appropriate tool to design Embedded and Tiny Embedded Systems.
8] Programming: Implementation of the chosen applications.

Text Book

2] Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide, Designing and Optimizing System Software", Morgan Kaufmann Publishers, 2nd Edition.
3] Alexander G. Dean, "Embedded Systems Fundamentals with Arm Cortex M Based Microcontrollers: A Practical Approach", ARM Education Media, 2nd Edition
4] K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2010, 3rd Edition
5] Steve Heath, "Embedded System Design", Elsevier India, 2nd Edition.

Web Links:

1. Joseph Sifakis, "Embedded systems design - Scientific challenges and work directions 2009 Design", Automation & Test in Europe Conference & Exhibition https://ieeexplore.ieee.org/document/5090623
2. Gabor Karsai; Fabio Massacci; Leon Osterweil; Ina Schieferdecker, "Evolving Embedded Systems", Computer , VOL. 43, issue 5 https://ieeexplore.ieee.org/document/5472888
3. Sachin P. Kamat, "An eye on design: Effective embedded system software", IEEE Potentials, VOL. 29, issue 5 https://ieeexplore.ieee.org/document/5568178
4. Yanbing Li; M. Potkonjak; W. Wolf, "Real-time operating systems for embedded computing", IEEE International Conference on Computer Design: VLSI in Computers and Processors, (ICCD), 12-15 Oct. 1997 https://ieeexplore.ieee.org/document/628899

References

4] Jonathan W. Valvano, "Embedded Systems: Introduction to Arm® Cortex™-M Microcontroller- Vol 01", CreateSpace Independent Publishing Platform, 1st Edition

5] Jonathan W. Valvano, "Embedded Systems: Real-Time Operating Systems for Arm® Cortex™-M Microcontrollers", CreateSpace Independent Publishing Platform, 1st Edition.

6] ARM Cortex Datasheet available on (https://www.arm.com/)

7] Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems- From Design to Networking with C/C++", Prentice Hall, 1st Edition

Topics relevant to "EMPLOYABILITY SKILLS": ARM architecture, ARM Programming, Real Time Operating Systems for developing **Employability Skills** through **Participative Learning**. This is attained through assessment component mentioned in course handout.

CSA3029 – Storage Area Networks

Course Code: CSA3029	**Course Title:** Storage Area Networks **Type of Course: Discipline elective**	**L- T- P- C**	3	0	0	3
Version No.	1					
Course Pre-requisites	Basics of information storage					
Anti-requisites						
Course Description	The course aims to equip students with basic introduction to Storage Area Networks, including storage architectures, logical and physical components of a storage infrastructure, managing and monitoring the data center and basic Disaster Recovery principles.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Storage Area Networks** attain **Employability** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO1** Identify key challenges in managing information and analyze different storage networking technologies. [Understanding] **CO2** Explain physical and logical components of a storage infrastructure of RAID, and intelligent storage systems. [Comprehension] **CO3** Describe Object and Content addressed storage and storage virtualization. [Comprehension] **CO4** Articulate business continuity solutions—backup and archive for managing fixed content. [Application]					
Course Content:						
Module 1	**Storage System: Introduction to Information Storage**	Assignment	Data Collection/Interpretation			**10 Sessions**
Topics: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. **Data Center Environment:** Application Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application						
Module 2	**Data Protection – RAID, Intelligent Storage Systems**	Case studies / Case let	Case studies / Case let			**08 Sessions**
Topics: RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison.						

Intelligent Storage Systems: Components of an Intelligent Storage System, Types of Intelligent Storage Systems.				
Module 3	**Object-Based and Unified Storage**	Quiz	Case studies / Case let	**08 Sessions**
Topics: Object-Based Storage Architecture: Components of OSD, Object Storage and Retrieval in OSD, Benefits of Object-Based Storage, Content-Addressed Storage. **Virtualization in SAN:** Block-level Storage Virtualization, Virtual SAN (VSAN)				
Module 4	**Backup and Archive, Replication**	Quiz	Case studies / Case let	**10 Sessions**
Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments. **Local Replication:** Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas. **Remote Replication:** Modes of Remote Replication, Remote Replication Technologies.				
Targeted Application & Tools that can be used:				
Project work/Assignment:				
Assignment: Group Seminar/Quiz				
Text Book **T1.** G. Somasundaram, Alok Shrivastava. "*Information Storage and Management"*, EMC Education Services, Wiley India. 2nd Edition.2012.				
References **R1**. Ulf Troppens, Rainer Erkens and Wolfgang Muller. *"Storage Networks Explained*", Wiley India. 2nd Edition.2015. **R2.** Rebert Spalding. *"Storage Networks The Complete Reference*", Tata McGraw Hill, Indian Edition.2017. **R3.** Richard Barker and Paul Massiglia. "*Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs*", Wiley. 1stEdition.2008. **E-Resource: pu.informatics.global.** **Web resources:** Students may find articles and significance of SAN at https://www.ibm.com/topics/storage-area-network and EMC² and may refer an eBook on "Storage Area Network Essentials" A Complete Guide to Understanding and Implementing SANs by Richard Barker, Paul Massiglia				
Topics relevant to "EMPLOYABILITY SKILLS": Block-level Storage Virtualization, Virtual SAN (VSAN) for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.				

CSA3032 – SEMANTIC WEB TECHNOLOGIES

Course Code: CSA3032	**Course Title: SEMANTIC WEB TECHNOLOGIES** **Type of Course: Discipline Elective**	**L- T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Object Oriented Programming Web Technologies					
Anti-requisites	**NIL**					
Course Description	The aim of this course is to teach the students the concepts, technologies and techniques underlying and making up the Semantic Web. At the end of the course the student should be able to: understand and discuss fundamental concepts, advantages and limits of the semantic web; understand and use ontologies in the context of Computer Science and the semantic web; use the RDF framework and associated technologies such as RDFA; understand the relationship between Semantic Web and Web 2.0.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Semantic Web Technologies and attain **Employability Skills** through **Participative Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1] **Explain** the basics of Semantic Web and Social Networks. [Knowledge] 2] **Describe** Knowledge Representation for the RDF [Comprehension] 3] **Illustrate** the role of ontology and inference engines in semantic web [Application] 4] **Demonstrate** the applications of Semantic Web [Application]					
Course Content:						
Module 1	Introduction to Web Semantics	Assignment/Quiz	Building Models	**10 Sessions**		
Topics: Introduction to Web Intelligence, the World Wide Web, Building Models, Semantic Web Technologies, XML Programming. Assignment: Building Models						
Module 2	XML & RDF	Assignment	Resource Description Framework,	**10 Sessions**		
Topics: Modeling Information, Extensible Markup Language, Metadata and Data in Information Sharing, Resource Description Framework, RDF Schema Assignment: Resource Description Framework						

Module 3	Ontology in Semantic Web	Case study	Constructing Ontology	**10 Sessions**
Topics: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontologies in OWL, Ontologies for Standardizations. Assignment: Constructing Ontology				
Module 4	Data Security & Event Logging	Case study	Application of Semantic Web	**10 Sessions**
Topics: Application of Semantic Web, Web 2.0, Web Data Exchange and Syndication, Semantic Wikis, Semantic Web in Life Sciences, e-learning Assignment: Application of Semantic Web				
Targeted Application & Tools that can be used: **Search engine development, Facebook's open graph protocol, siri is a powerfull realization of the semantic web, yahoo, facebook, social networks based applications** **Professionally Used Software:**				
Assignment:				
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. Presidency University Library Link . **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.**				
Text Book(s): T1.Pascal Hitzler, Markus Krötzsch, Markus Krötzsch "Foundations of Semantic Web Technologies" CRC publication 2008 T2.John hebeler, Mathew fisher "Semantic Web Programming" 1st Edition Wiley; 1st edition (March 27, 2009)				

Reference(s):

Reference Book(s):

R1.Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons,2018.
R2.Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
R3.Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
R4.Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD,2020.

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

1. Semantic Web Technology - an overview | ScienceDirect Topics
2. Semantic Web Technologies | openHPI
3. Semantic Web Technologies for e-Learning: Models and Implementation (vu.lt)

Topics relevant to "EMPLOYABILITY SKILLS": Concepts of Semantic Web Technologies, Web Data Exchange and Syndication, Semantic Wikis, Semantic Web in Life Sciences for **d**eveloping **Employability Skills** through **Participative Learning**. This is attained through assessment component mentioned in course handout.

CSA3033- Robotic Process Automation

Course Code: CSA3033	**Course Title:** Robotic Process Automation Type of Course: Theory	L- P- T-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Basic Programming Concepts.					
Anti-requisites	NIL					
Course Description	Through real-world, pertinent data preparation use cases, this course aims to equip students with practical literacy in robotic process automation. It will help identify potential uses, benefits, and considerations of robotic process automation.					
Course Outcomes	On successful completion of this course the students shall be able to: Describe RPA, where it can be applied, and how it's implemented. Describe the different types of variables, control flow, and data manipulation techniques. Identify and understand image, text, and data table automation. Describe how to handle user events and various types of exceptions and strategies. Understand the deployment of the robot and how to maintain the connection.					
Course Content:						
Module 1	Introduction to robotic process automation	Assignment			08 Classes	
Topics: Scope and techniques of automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components of RPA, RPA platforms, The future of automation. RPA Basics: History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document - Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem.						
Module 2	RPA tool introduction and basics	Assignment			08 Classes	

Topics: Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data.				
Module 3	Advanced automation concepts & techniques	Assignment		08 Classes
Topics: Recording Introduction - Basic and Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval - Advanced Citrix Automation challenges - Best Practices - Using tab for Images - Starting Apps - Excel Data Tables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel – Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF.				
Module-4	Handling user events & assistant bots, exception handling	Assignment		08 Classes
Topics: Assistant bots - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event. Exception handling: Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.				
Module-5	Deploying and maintaining the bot	Assignment		08 Classes
Topics: Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages.				
Project work/Assignment:				

Assignment 1 on (Module 1 and Module 2)
Assignment 2 on (Module 3 and Module 4)
Assignment on (Module 5)

REFERENCE MATERIALS:

TEXTBOOKS

Alok Mani Tripathi, "*Learning Robotic Process Automation*", Packt Publishing, 2018.

REFERENCES

Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "*Introduction to Robotic Process Automation: a Primer*", Institute of Robotic Process Automation,1st Edition 2015.

Richard Murdoch, "*Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant*", Independently Published, 1st Edition 2018.

Srikanth Merianda, "*Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation"*, Consulting Opportunity Holdings LLC, 1st Edition 2018.

Lim Mei Ying, "*Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes*", Packt Publishing, 1st Edition 2018.

JOURNALS/MAGAZINES

IEEE Transactions on Automation Science and Engineering
ACM Transactions on Software Engineering and Methodology
IEEE Robotics and Automation Letters
Information Systems, Elsevier
Computers in Industry, Elsevier

WEB RESOURCES:

https://www.coursera.org/specializations/roboticprocessautomation

https://www.uipath.com/rpa/robotic-process-automation

https://www.academy.uipath.com

CSA3034 – Parallel Computing

Course Code: CSA3034	**Course Title:** Parallel Computing **Type of Course:** Discipline Elective	L-T-P- C	1	0	4	3
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	To study the scalability & clustering issues, understand the technologies used for parallel computation, study the different inter connection networks and the different software programming models. `					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Parallel Computing** and attain **Employability Skills** through E**xperiential Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Study the scalability and clustering issues and the technology necessary for them. [Knowledge] 2. Understand the technologies enabling parallel computing. [Comprehension] 3. Practice the different types of interconnection networks. [Application] 4. Demonstrate the software support needed for shared memory programming. [Application]					
Course Content:						
Module 1	**SCALABILITY AND CLUSTERING**	Quizzes and assignments	Simulation	**15Sessions**		
Evolution of Computer Architecture – Dimensions of Scalability – Parallel Computer Models – Basic Concepts Of Clustering – Scalable Design Principles – Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues – Semantic Issues In Parallel Programs.						
Module 2	**SYSTEM INTERCONNECTS**	Quizzes and assignments	Simulation	**15 Sessions**		
Basics of Interconnection Networks – Network Topologies and Properties – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms.						
Module 3	**PARALLEL PROGRAMMING**	Term paper/Assignment	Simulation	**15 Sessions**		
Paradigms And Programmability – Parallel Programming Models – Shared Memory Programming.						
Module 4	**MESSAGE PASSING PROGRAMMING**	Term paper/Assignment	Simulation	**15 Sessions**		

Message Passing Paradigm – Message Passing Interface – Parallel Virtual Machine.

List of Laboratory Tasks:

1. Basics of MPI (Message Passing Interface)
2. To learn Communication between MPI processes
3. To get familiarized with advance communication between MPI
4. Study of MPI collective operations using 'Synchronization'
5. Study of MPI collective operations using 'Data Movement'
6. Study of MPI collective operations using 'Collective Computation'
7. To understand MPI Non-Blocking operation
8. Basics of OpenMP API (Open Multi-Processor API)
9. To get familiarized with OpenMP Directives
10. Sharing of work among threads using Loop Construct in OpenMP
11. Clauses in Loop Construct
12. Sharing of work among threads in an OpenMP program using 'Sections Construct'
13. Sharing of work among threads in an OpenMP program using 'Single Construct'
14. Use of Environment Variables in OpenMP API

Targeted Application & Tools that can be used:

Any IDE – JDK, NetBeans and etc.

Assignment:

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

Text Book

1. Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", Tata McGraw-Hill, New Delhi, 2003.

References

1. David E. Culler & Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/Software Approach", Morgan Kaufman Publishers, 1999.
2. Michael J. Quinn, "Parallel Programming in C with MPI & OpenMP", Tata McGraw-Hill, New Delhi, 2003.
3. Kai Hwang, "Advanced Computer Architecture" Tata McGraw-Hill, New Delhi, 2003.

E-Resources

1. https://onlinecourses.nptel.ac.in/noc21_cs39/preview(Introduction to Parallel Computing)
2. https://www.coursera.org/courses?query=parallel%20computing
3. https://online.stanford.edu/courses/cs149-parallel-computing
4. https://presiuniv.knimbus.com/user#/home
5. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehostlive

Topics relevant to "EMPLOYABILITY SKILLS": Message Passing Interface – Parallel Virtual Machine for developing **Employability Skills** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

CSA3049 – Software Metrics and Quality Management

Course Code: CSA3049	**Course Title:** Software Metrics and Quality Management **Type of Course: Discipline elective**	**L- T- P- C**	**2**	**0**	**2**	**3**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course will focus on the processes, principles, and techniques of software testing and analysis. It covers a full spectrum of topics from basic principles and underlying theory of testing to organizational and process issues in real-world applications. The emphasis is on selecting practical techniques to achieve an acceptable level of quality at an acceptable cost. This course will provide software engineering professionals with realistic strategies for reliable and cost-effective software testing.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Software Metrics and Quality Management** attain **Employability** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of this course the students shall be able to:** • To understand software testing and quality assurance as a fundamental component of software life cycle **[Knowledge]** • To efficiently perform T & QA activities using modern software tools **[Comprehension]** • To prepare test plans and schedules for a T&QA project **[Application]**					
Course Content:						
Module 1	Introduction to Quality			**12 Hours**		
Topics: **Introduction to Quality:** Historical Perspective of Quality, what is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.						

Module 2	Software Quality			**12 Hours**
Topics: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.				
Module 3	Software Verification and Validation			**14 Hours**
Topics: Introduction, Verification, Verification Workbench, Methods of Verification, Type, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. V-test Model: Introduction, V-model for software, Testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.				
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course				
1] Case study on real time software applications like MSTeam 2] Implementation of verification and validation for any realtime software application.				
Text Book **T1** Software Testing and Continuous Quality Improvement, William E. Lewis, CRC Press, 3rd,2016. **T2** Software Testing: A Craftsman's Approach, Paul C. Jorgenson, CRC Press, 4th, 2017.				
References R1. P. Ammann and J. Offutt. Introduction to Software Testing. Cambridge University Press, 2008. R2.https://www.tutorialspoint.com/software_quality_management/software_quality_management_metrics.htm https://nptel.ac.in/courses/106105150 https://nptel.ac.in/courses/106101163				
Topics relevant to "EMPLOYABILITY SKILLS": V-test Model: Introduction, V-model for software for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.				

CSA3050 - Ethical Hacking

Course Code: CSA3050	**Course Title:** Ethical Hacking **Type of Course:** Discipline Elective	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	basic networking tools knowledge and Cryptography & Network Security					
Anti-requisites	NIL					
Course Description	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					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Ethical Hacking attain **Employability** through **Experiential Learning** techniques.					
Course OutComes	On successful completion of this course the students shall be able to: 1] Illustrate the importance of ethical hacking 2] Categorize the various techniques for performing reconnaissance. 3] Demonstrate various types of system scanners and their functions 4] Demonstrate the function of sniffers on a network					
Course Content:						
Module 1	**Introduction to Hacking** (Knowledge, Application)	Assignment	Programming activity	**12 Hours**		
Topics: Introduction to Hacking-Important Terminologies - Asset - Vulnerability - Penetration Test - Vulnerability Assessments versus Penetration Test - Penetration Testing Methodologies - Categories of Penetration Test. **Assignment:** Different phase methodologies on penetration testing						
Module 2	**Linux Basics**	Assignment	Programming activity	**10 Hours**		
Topics: Major Linux Operating Systems - File Structure inside of Linux - BackTrack - Changing the Default Screen Resolution - Some Unforgettable Basics. **Assignment:** Penetration testing distribution						
Module 3	**Information Gathering Techniques**	Assignment	Programming activity	**11 Hours**		

Topics:
Sources of Information Gathering - Copying Websites Locally - NeoTrace - Xcode Exploit Scanner - Interacting with DNS Servers - DNS Cache Snooping - DNS Lookup with Fierce - SNMP - SMTP.
Assignment: Domain internet groper

Module 4	**Target Enumeration and Port Scanning Techniques**	Assignment	Programming activity	**12 Hours**

Topics:
Target Enumeration and Port Scanning Techniques - Host Discovery - Scanning for Open Ports and Services - Types of Port Scanning - Vulnerability Assessment.
Assignment: Demonstrations for port scanning

Targeted Application & Tools that can be used: Application Software and open source tools

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

Any appropriate tool can be given to demonstrate i.e Sql injections.

Text Book

1] Rafay Baloch, 2014: "Ethical Hacking and Penetration Testing Guide" Apple Academic Press Inc.

References

2] Gary Hall, Rrin Watson, 2016: "Hacking: Computer Hacking, Security Testing,Penetration Testing, and Basic Security".

3] James Corley, Kent Backman, Michael Simpson, 2010: "Hands-On Ethical Hacking and Network Defense", 2nd Edition, Cengage Learning.

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.

CSA3051 – .NET Programming Using C#

Course Code: CSE3051	**Course Title: .NET Programming Using C#** **Type of Course: Program Core Theory & Laboratory integrated**	**L-T- P - C**	**1**	**0**	**4**	**3**
Version No.	1.1					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course is designed to teach third-year computer science students, to provide an introduction to the .net framework and C# language. This course deals with the programming skills that are required to create applications using the C# language. Helps the students to build an application that incorporates several features of the .NET Framework.					
Course Objective	The objective of the course is to **SKILL DEVELOPMENT** of student by using problem solving methodology.					
Course Out Comes	**COURSE OUTCOMES:** On successful completion of the course the students shall be able to**:** C01: Apply OOPS concepts in C# for solutions to real-world problems [Knowledge]. C02: Creating ADO.NET GUI [Application]. C03: Demonstrating Write GUI applications in C# [Application]. C04: Creating the application with the help of database [Application].					
Course Content:						
Module 1	**C # Language Syntax**	Assignment	Programming Task	**12 Sessions**		

Topics: Knowledge

C # Language Syntax - Datatypes & Variables Declaration, Implicit and Explicit Casting, Checked and Unchecked Blocks, Enum and Constant, Operators, Control Statements, Working with Arrays, working with Methods, Pass by value and by reference and out parameters.

OOPs-Concept - Learning about Class, Object, Component, encapsulation, Inheritance, Polymorphism.Abstract Class, Overview of Interface, Types of Inheritance.

Exception Handling-Defining Exception, Understandings try and catch keywords, Using "finally" block, "using" statement, Throwing exceptions, Creating User-defined/Custom Exception class.

IO Streams - What are a stream, Types of Stream, Standard I/O Streams, Console, Handling text in files, Dealing with Binary files.

Module 2	**Developing GUI Application Using WINFORMS**	Assignment	Data Collection/Excel	**12 Sessions**

Topics: Application

Developing GUI Application Using WINFORMS- Basic Controls, Panel & Layouts, Drawing and GDI Devices, MenuStrip, ToolbarStrip and Context MenuStrip , Model and Modeless Dialog boxes ,Multiple Document Interface(MDI) ,Form Inheritance , Building Login Form, Working with Resource Files and Setting, Notify Icon Controls, Using Components like Timer, FileSystemWatcher, Process, BackgroundWorker . Drag and Drop.

Module 3	**Managing Data using DataSet**	Assignment	Programming/Data analysistask	**14 Sessions**

Topics Application

Managing Data using DataSet -Introduction DataSet and its Object Model, Filling DataSet using DataAdapter, Binding DataSet to DataGridView, Updating changes to the database using DataAdapter, DataAdapter events.

A few Advanced Features-Reflection and Attributes, Delegates & Events**,** User Control and Custom Control. Multithreading- Threading Overview, Thread States, Methods of Thread Class, Thread Pool, Thread Synchronization. Packaging and Deployment**.**

Module 4

Topics 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, How to implement Login facility with the database, Inserting Image into a Database table

Targeted Application & Tools that can be used:

Project work/Assignment:

Text Book

1. Andrew Troelsen, "C# and the .NET Platform"
2. J . Liberty, "Programming C#", O'Reilly

References

R1:E. Balagurusamy, "Programming in C#", Tata McGraw-Hill.

R2: Microsoft Visual C# Step by Step, 9th Edition By John Sharp, Microsoft Press

R3:Herbert Schildt, "The Complete Reference: C#"

Weblinks:

https://dotnet.microsoft.com/en-us/apps/aspnet

Case study link:

https://www.researchgate.net/publication/296561714_C_and_the_NET_Framework

https://docs.microsoft.com/en-us/dotnet/csharp/getting-started/

E book link R1:

https://www.oreilly.com/library/view/mastering-c-and/9781785884375/

E book link R2:

https://www.packtpub.com/product/mastering-c-and-net-framework/9781785884375

Topics relevant to development of ".NET Programming Using C#":

MVC — Model-View-Controller is a software design pattern. It describes interactions between the three components of a web application and its GUI.

Topics relevant to development of "": Learning about Class, Object, Component, encapsulation, Inheritance, Polymorphism.
Understanding the Role of Managed Provider and ADO.NET Objects, Connecting to Database and Connection Pooling,

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Course Code: CSA 3090	**Course Title: XR Development** **Type of Course: Discipline elective :Theory with Integrated Lab**	**L-T-P-C**	**1**	**0**	**4**	**3**
Version No.	1.0					
Course Pre-requisites	CSA2017- Virtual Reality Development					
Anti-requisites	NIL					
Course Description	An XR Development course that focuses on the development of immersive and interactive experiences for virtual reality (VR), augmented reality (AR), and mixed reality (MR) platforms. The course cover topics such as creating 3D environments and models, programming interactive elements, user interface design, and optimization for different XR devices. Students may learn how to use software and tools such as Unity, Unreal Engine, and Vuforia to develop XR applications for gaming, education, training, and other industries.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **XR Development** and attain **Employability** through **Experiential Learning** techniques.					
Course Out Comes	At the end of the course the student should be able to: CO1: Infer the XR development principles [Understand] CO2: Demonstrate the XR experiences for different devices and platforms [Apply] CO3: Relate the importance of Visual Perception [Analyze] CO4: Apply the industry standards and trends in XR development [Apply]					
Course Content:	Essentials of XR Development, AR Best Practices -VR Best practices – MR Experiences- Visual Perception – Auditory Perceptions – Motion Capture - VR Game Development					
Version No.	1.0					
Module 1	**Module: 1: Essentials of XR Development**	**Assignment**	Case Studies on VR Applications		**No. of Classes:19**	
Topics: principles of virtual reality, augmented reality, and mixed reality - XR development software and tools- 3D modelling and animation - interactive design - optimization techniques - XR devices – XR game development principles.						
Module 2	**AR VR Best Practices**	**Assignment**	ARVR Application		**No. of Classes:18**	
Topics: AR Development- Projection-Based Augmented Reality- Location-Based Augmented Reality- VR Experience – Introduction to HMD architecture – VR Applications – Best Practices. Assignment: Game Design Activities						

Module 3	**Visual and Auditory Perception**	**Assignment**	Game Programming	**No. of Classes:19**
Topics: Visual perception : Resolution -Field of View – Latency- Lighting – Colour- Depth Perception - Comfort and ergonomics – Embodiment - Spatial audio- Sound localization Assignment: Game Programming				
Module 4	**Game Development and Motion Capture**	**Case Study**	3D Game Development	**No. of Classes:19**
Topics: VR Game Development – Locomotion – Teleportation -Introduction to Motion Capture - mocap in VR - Real-time feedback - Immersion – VR Game Development. Case study: 3D Game Development				

List of Laboratory Tasks:

1. 3D Modelling in Unity
2. Introduction to Vuforia Engine
3. AR application development
4. Plane Based projection
5. Horizontal and Vertical Projection
6. Multi target projection
7. VR Experience Development
8. VR Use case 1 – Walk on the Bridge
9. VR use Case 2 – Construction Modeling and Visualization
10. VR use Case 3 – Machine Modeling
11. Motion Capture
12. Ray Cast and Feedback system
13. Multiplayer in VR World
14. VR Game Development
15. VR Game Development

Targeted Application & Tools that can be used:

Unity 3D, Visual Studio

Textbook(s):

2. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile" by Tony Parisi, 2015.
3. "Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer, 2016

References

1. "Unity 2018 Augmented Reality Projects" by Jonathan Linowes
2. "Virtual Reality for Physical and Motor Rehabilitation" by Virtual Reality for Physical and Motor Rehabilitation, 2014.

Weblinks:

https://unity.com/solutions/vr
https://docs.unity3d.com/Manual/index.html
https://learn.unity.com/

Topics relevant to "EMPLOYABILITY SKILLS": Augmented reality, mixed reality, XR development software and tools, 3D modeling and animation for developing **Employability Skil** through **Experiential Learning techniques.** This is attained through assessment component mention in course handout.

CSA2015-3D Game Design and Development

Course Code: CSA2015	**Course Title:** 3D Game Design and Development **Type of Course:** DE & Lab Integrated only	**L-TI P- C**			3
Version No.	1.0				
Course Pre-requisites	**NIL**				
Anti-requisites	**NIL**				
Course Description	This course in 3D Game Design and Development covers the basics of creating 3D games for various platforms such as PC, consoles, and mobile devices. The course will cover topics such as game design, 3D modeling, texturing, animation, physics, and scripting, as well as game engines and development tools. Students will learn how to bring their game ideas to life by using industry-standard software and techniques to create immersive and interactive 3D game environments. The course may also touch upon topics such as game monetization, marketing, and distribution. The goal of the course is to provide students with the skills and knowledge necessary to design and develop their own 3D games.				
Course Objectives	The objective of the course is to familiarize the learners with the concepts **3D Game Design and Development** and attain **Skill Development** through E**xperiential Learning** techniques.				
Course Outcomes	**On successful completion of this course the students shall be able to:** **1] Describe game design principles and game development processes.** **2] Discuss game industry standards, trends, and best practices.** **3] Prepare a complete, playable 3D game.**				
Course Content:					
Module 1	Introduction to Game Design and 3D Modeling	Assignment	Develop a detailed GDD	**15 Sessions**	
Topics: **Concept and ideation, game design document, pre-production, kanban, production, overview of unity and blender, prototyping, game mechanics, game dynamics, level design, concepts of emergence, progression, internal economy, identification and fixing of bugs and issues in the game, maintenance and support.**					
Module 2	Animation, texturing and Physics	Case Study	The growth of Havok	**15 Sessions**	
Topics: **Introduction to animation, keyframe animation, motion capture, character animation, inverse kinematics, particles and effects, shading, light and ray casting, texture mapping, physically**					

based rendering for texturing, substance designer, techniques for unwrapping 3d models for texturing, rigid body dynamics, soft body dynamics, collision detection, physics-based animation, major physics engines.				
Module 3	Development Tools	Assignment	Edit a small 3D game	**15 Sessions**
Topics: **JVisual studio overview, version Control and Git, bug tracking and jira, overview of project management tools like Trello, development workflow, Collaboration Tools slack, Debugging and Profiling, overview of automation tools like Jenkins, game engines such as unity.**				
Targeted Application & Tools that can be used: **Application Area:** Unity, Visual Studio **TOPICS RELEVANT TO OBJECTIVE:Visual studio overview, Introduction to animation,, Collaboration Tools slack**				
Project work/Assignment:				
Assignment: 1] Developing a detailed Game Design Document. **Project Assignment: 1]** Edit a small 3D game				
Text Book: 1. **Gregory, J., & Lemarchand, R. (2018). "Game Engine Architecture," 3rd Edition. CRC Press**				
References: 1. Rollings, A., & Morris, D. (2009). "Game Architecture and Design: A new edition". New Riders. 2. Rabin, S. (2020). "Game AI Pro 360 Guide to Architecture". CRC Press, Taylor & Francis Group. 3. D. H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics". 2006, CRC Press. **https://sm-nitk.vlabs.ac.in/** https://nptel.ac.in/courses/105105157 https://presiuniv.knimbus.com/user				
Topics relevant to "SKILL DEVELOPMENT": Visual studio overview, Introduction to animation, Collaboration Tools slack for **Skill Development** through **Experiential Learning techniques. This is attained through assessment component mentioned in course handout.**				
Catalogue prepared by	Dr. Pradeep Bhaskar, Mr. Vetrimani Elangovan			
Recommended by the Board of Studies on	BOS NO: th. BOS held on BOS 14			
Date of Approval by the Academic Council	Academic Council Meeting No. , Dated 17-02-2022			

Course Code: CSA3038	**Course Title: AR/VR based Game Development** **Type of Course: Discipline elective**		**L- T-P-C**	1	0	4	3
Version No.	1.0					
Course Pre-requisites	CSA2015- 3D Game Development					
Anti-requisites	**NIL**					
Course Description	This course on AR/VR based Game Development provides an in-depth exploration of the technologies, tools, and techniques used to create games and interactive experiences using augmented reality (AR) and virtual reality (VR) technologies. A comprehensive introduction to the programming concepts and techniques required for AR/VR game development, including 3D graphics programming, physics simulation, and networking is included. Students will also have an understanding of the development workflow for AR/VR games, from planning and design to deployment and optimization as well as obtain a hands-on experience designing and developing AR/VR games, using the skills and knowledge acquired in the course.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **AR/VR based Game Development** attain **Employability** through **Experiential Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Demonstrate the requirements for AR VR Game Production. [Understand] **CO2:** Develop Virtual Reality Experience and game [Apply] **CO3:** Build the AR based Game and Application using Game Engine. [Apply] **CO4:** Analyze the game mechanics from the feedback [Analyze]					
Course Content:						
Module 1	**Introduction to AR/VR Technologies and game design**	**Assignment**	**Research and write a report on AR/VR technologies and their current applications**			**25 Sessions [5-T, 20-L]**
Topics: Overview of AR and VR technologies, applications, latest hardware, software requirements, Overview of AR/VR development tools and platforms, game design considerations, game design document, interaction design, level design, user experience design, game mechanics.						
Module 2	**VR Gaming & Experience**	**Case Study**	**Draw the Levels of VR game on paper**			**25 Sessions [5-T, 20-L]**
Topics: The Geometry of Virtual Worlds - Light and Optics - Visual Rendering - Interaction - Evaluating VR Systems and Experiences – VR Game Development - Comfort and VR Sickness						

Module 3	**AR Gaming and Application**	**Assignment**	**Test and optimize an AR game and Application in Android/IoS**	**25 Sessions [5-T, 20-L]**

Topics:

Vuforia Engine Integration -AR Setup – Targets and Anchors - AR Foundation - Scene setup- Subsystems- Managers – AR Application and Game Development

Targeted Application & Tools that can be used:

1. Setting Up an AR/VR Project in Unity
2. Creating and Deploying an AR Experience
3. Building an Interactive VR Environment
4. Implementing Object Manipulation in AR
5. Creating a VR-Based Teleportation System
6. Augmented Reality Image Tracking
7. Designing a VR First-Person Controller
8. AR-Based 3D Object Placement Game
9. Physics-Based Interactions in VR
10. Multiplayer AR Game Using Networked Components
11. AR Treasure Hunt Game
12. VR Escape Room Game
13. AR Tower Defense Game
14. VR Shooting Range Game
15. AR Basketball Game

Targeted Application & Tools that can be used:
Unity, Visual Studio

Project work/Assignment:

Assignment: 1] Report on AR/VR technologies and their current applications.
Project Assignment: 1] Test and optimize an AR/VR game

Text Book:

T1. LaValle, Steven M. *Virtual reality*. Cambridge university press, 2023.
T2. Tacgin, Z. (2020). *Virtual and augmented reality: an educational handbook*. Cambridge Scholars Publishing.

References:

R1 Macklin, C., & Sharp, J. (2016). *Games, Design and Play: A detailed approach to iterative game design*. Addison-Wesley Professional.
R2. E. Pangilinan, S. Lukas, V. Mohan, (2019), "Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", 1st Ed., O'Reilly Publications.

Web References:

- https://unity.com/solutions/xr/ar
- https://docs.unity3d.com/Packages/com.unity.xr.arfoundation@5.0/manual/index.html

Topics: Topics relevant to "EMPLOYABILITY SKILLS": VR user interaction methods, interaction design, level design, user experience design for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

CSA3062 - Game Programming for Hand Held Devices

Course Code: **CSA3062**	**Course Title: Game Programming for Hand Held Devices** **Type of Course: Discipline elective**	**L-T-P-C**	1	0	4	3
Version No.	1.0					
Course Pre-requisites	Knowledge of C#					
Anti-requisites	Nil					
Course Description	This course offers an immersive exploration into the dynamic world of game development for hand held devices. Designed to equip students with specialized skills, this program delves into the intricacies of creating captivating games optimized for hand-held devices including smartphones and tablets. Participants will master game design principles, 2D and 3D graphics rendering, user interface development, and touch-based input handling. Leveraging industry-standard tools and frameworks, students will craft interactive gameplay mechanics, implement audio and visual effects, and optimize performance for diverse mobile platforms. Throughout the course, hands-on projects and real-world simulations will empower learners to develop innovative mobile games from concept to deployment.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Game Programming for Hand Held Devices** attain **Employability** through **Participative Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Summarize the fundamental principles and techniques of game programming. 2. Develop functional mobile games optimized for mobile devices. 3. Develop functional AR/VR games.					
Course Content:						
Module 1	Fundamentals of Game Programming	Assignment	Case Study			**02+08 Hours**
Topics: Introduction to Games, Basic elements of games, Game Design Tools- Constraint- Direct and indirect actions- Goals-Challenge- Skill, strategy, chance, and uncertainty- Decision-making and Feedback-Abstraction-Theme-Storytelling-Context of Play. Basic programming using C#, Game Theory, Unity Interface, Tools, Game Objects, Components, Camera, Lightning, Building Platform and Project Preferences. Unity Editor Interface: Main Menu- Tool bar- Scene View-Game View-Hierarchy						

Window-Project Window-Inspector Window-Console Window-Status Bar -Primitive 2D Game Objects [Blooms 'level selected**: Understanding**]				
Module 2	Augmented Reality (AR) Technologies	Assignment	Programming	**3+12 Hours**
Topics: **Iterative Game Design Process – Conceptualize, Prototype Playtest and Evaluate Game Play in 2D, 2D graphics, Sprites, Sprite Editor, Sprite Renderer, Sprite Creator, Rigidbody 2D, Box Collider 2D and Hinge Joint 2D. 2D Sorting Transparent Queue Sorting Order by Priority Sorting Layer and Order in Layer. Material/Shader**, **Unity Mono Behaviour, Rotations translations, layers, sample game.** [Blooms 'level selected: **Applying**]				
Module 3	Implementing user interactions and gestures in AR applications	Assignment	Programming/Problem Solving	**3+12Hours**
Topics: Introduction to Augmented Reality and its applications, types of AR applications, devices and hardware. Introduction to Unity and AR Foundation for AR application development, Unity for AR application development, Animating AR assets and designing immersive user interfaces, Implementing user interactions and gestures in AR applications. [Blooms 'level selected: **Applying**]				

List of Laboratory Tasks:

1. **Experiment No 1:** Introduction to Unity Game Engine. **[2 hours: Application Level]**
2. **Experiment No. 2:** I/O and Object Handing in Unity using C#. **[2 hours: Application Level]**
3. **Experiment No. 3:** Introduction 2D graphics – Sprites- Sprite Editor. **[2 hours: Application Level]**
4. **Experiment No. 4:** Primitive 2D Game Objects and Basic Tools. **[2 hours: Application Level]**
5. **Experiment No**. 5: Game Object Components and Materials and Textures. **[2hours: Application Level]**
6. **Experiment No. 6**: 2D Game Platform and Asset Management. **[4 hours: Application Level]**
7. **Experiment No. 7:** Transformation of Objects. **[2 hours: Application Level]**
8. **Experiment No.8:** Colliders, Collisions, Triggers. **[2 hours: Application Level]**
9. **Experiment No.9:** Advanced Unity Programming. **[4 hours: Application Level]**
10. **Experiment No.10:** Creating Mobile game. **[4 hours: Application Level]**
11. **Experiment No.11:** Creating AR game. **[4 hours: Application Level]**
12. **Experiment No.12:** Creating AR Cloud Experiences. **[4 hours: Application Level]**

Targeted Application & Tools that can be used:

Application Area is to understand and apply concept of object oriented concepts using C#
Tools/Simulator used: Unity.

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

1. **Assignment: Platformer in 2D Interface**
2. **Project Work: Design and develop an interactive augmented reality application**

Text Book

1. **Nicolas Alejandro Borromeo , "Hands-On Unity 2022 Game Development", Packt Publishing, 1st edition, 2022.**

References

1. Jodessiah Sumpter, "Make a 2D Arcade Game in a Weekend With Unity", Apress 2015.
2. Ernest Adams, "Fundamentals of Game Design", Pearson Education, 2012.
3. Casie Hardman, "Game Programming with Unity and C#: A Complete Beginner's Guide", Apress Publication, 2020.

Topics relevant to development of "Foundation, Skill Development, Employability":

C#, Unity

Topics relevant to "HUMAN VALUES &PROFESSIONAL ETHICS": Solving real time Problems & Data collection for an assignment.

Topics relevant to "EMPLOYABILITY DEVELOPMENT": Unity for AR application development, Animating AR assets and designing immersive user interfaces **for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in the course handout.**

Course Code: CSA 3069	**Course Title: Rendering Techniques** **Type of Course: Discipline Elective: Theory Only**		**L-T-P- C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	**NIL**						
Anti-requisites	**NIL**						
Course Description	**The Game Rendering course covers the fundamental concepts and techniques used in the process of rendering 2D and 3D graphics in video games. The course is designed to provide students with a comprehensive understanding of principles of game rendering and knowledge about industry standard tools and techniques.** **The students learn how to identify, differentiate, and categorize a wide range of game rendering methods. Through interactive lectures, assignments and group projects students learn how to determine which rendering techniques are best suited for achieving an intended gameplay result, and to judge whether or not the game rendering has been implemented successfully.**						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Rendering Technique and attain **Employability** through **Problem Solving** techniques.						
Course Outcomes	**On successful completion of this course the students shall be able to:** **1] Recognize the concepts and techniques used in 3D graphics, including transformations, texturing and shading.** **2] Discuss application of light and shadows in digital games.** **3] Review advanced rendering techniques.**						
Course Content:							
Module 1	Introduction to Game Rendering	Assignment	Research Assignment	**10 Sessions**			
Topics: **Introduction, basic concepts of Game Rendering. Graphics rendering pipeline including co-ordinate systems, polygon representation of 3D objects, pixel level process, rasterization, interpolative or incremental shading and merging. Basics of transforms and its applications.**							
Module 2	Shading and Texturing	Case Study	Evolution of shading techniques	**10 Sessions**			
Topics: **Shading basics, light sources, aliasing and anti-aliasing, transparency, alpha, compositing, texturing pipeline, image texturing, texture animation, material and parallax mapping, textured lights.**							
Module 3	Shadows and light	Assignment	Sketch a living room with a single source of illumination	**12 Sessions**			

Topics:
Light and colour, physics of light, ray tracing, camera, reflectance distribution models, microfacet theory, layered materials, blending and filtering materials, local and global illumination, shadows on planes and curves, shadow maps, ray tracing, texturing pipeline, texture animation, material mapping.

Module 4	Advanced Rendering Techniques	Project	Apply rendering principles using C# or python	**13 Sessions**

Topics:
Image space effects, skyboxes, sprites and layers, volumetric rendering, sky rendering, subsurface scattering, polygonal techniques, pipeline optimization, acceleration algorithms, virtual and augmented reality applications, future applications.

Targeted Application & Tools that can be used:

Application Area: Understanding and planning effective game rendering resulting in engaging visual game experience.
Professionally Used Software: *Python, C#, Unity, Pixar Renderman, MS Excel*

Assignment: 1] Sketch a living room with a single source of illumination.
Project Assignment: 1] Apply rendering principles using C# or python to display a reflecting sphere.

Text Book:

2. **Möller Tomas, Haines, E., & Hoffman, N. (2019). "Real-time Rendering", 4th Edition. CRC Press.**

References:

4. **Watt, A. H., & Watt, M. (2005). "Advanced animation and rendering techniques: Theory and practice", 2nd Edition. ACM Press**
5. **Shirley, P., Marschner, S., Ashikhmin, M. (2009). Fundamentals of Computer Graphics. A K Peters.**

Topics relevant to "EMPLOYABILITY SKILLS": Concepts of Game Rendering, Graphics rendering pipeline, representation of 3D objects, image texturing, texture animation for developing **Employability Skill** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code: CSA3012	**Course Title: CHARACTER MODELING AND RIGGING** **Type of Course:Program Core: Laboratory only**	**L- -T-P-C**	**1**	0	4	3
Version No.	1					
Course Pre-requisites	Students should have basic knowledge of Graphic Design					
Anti-requisites	Nil					
Course Description	This course is designed, to fundamentals of Character modeling and rigging through the interface of the blender tool, this comprehensive course is packed with useful techniques that ease you into the workflow of the program to meet the industry's need for creating character designing and rigging methods to create models that are essential for research and study. A character rigger generates the internal structural frameworks and controls of a 3D model, defining how the student will be able to manipulate it. Their goal is to build a skeleton that will operate a character and bring it to real life.					
Course Objective	The objective of the course is to familiarize the learners with the concepts **Character Modelling and Rigging** and attain **Skill Development** through E**xperiential Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** • CO1 Explain the basic blender tools for creating model [Comprehension] • CO2 Produce the 3D Character for game or animation movie [Application] • CO3 Produce an original design for a 3D character with rigging. [Application]					
Course Content:						
Module 1	**Bender Basics**	Assignment	Data Collection/Interpretation			**3 Sessions**
Introduction, Blender user Interface, Understanding the 3D View, Navigating the 3D View, Managing Areas, Editor Types , Using 3D Cursor , Blender User Preferences, Creating Objects , Basic Mode and Advance mode , Naming Objects and Data blocks , Interaction mode, Modifiers , Materials , lighting and rendering.						
Module 2	**Character Design in Blender:**	Case studies / Case let	Case studies / Case let			**3 Sessions**
Character Design in Blender – Creation Plan (Preproduction , Production & Postproduction) , Character Description, Designing the Character – Character Reference Images , Character Modelling Methods , Modeling the Eyes , Modeling the Eyes , Modeling the Face , Modeling the Torso and Arms ,and Final Detail , Unwrapping the rest of the character						
Module 3	**Character Rigging in Blender:**	Quiz	Case studies / Case let			**3 Sessions**
Understanding the Rigging process, Working with Armatures, Rigging Character (Skeleton , Legs , Torso and Head , Arm & Hand , Mirroring Rig , Rig Organization , Skinning , Creating the Facial Rig , Creating custom shapes , Applying final touches to the Rig						
List of Laboratory Tasks:						

1. Creating a simple, low-poly character model and rigging it for basic animations.
2. Experimenting with different rigging techniques, such as forward kinematics, inverse kinematics, and constraint-based rigging.
3. Creating a complex, high-poly character model and rigging it with advanced techniques.
4. Testing and comparing the performance of different rigging solutions for the same character model.
5. Creating a character rig with custom controls and automating secondary actions, such as cloth simulation or hair dynamics.
6. Experimenting with rigging tools and scripting to automate rigging tasks, such as creating bendy bones or rigging a face rig.
7. Rigging a character for facial animation, including lip-sync and dialogue.
8. Implementing rigging solutions for special requirements, such as multi-limbed characters or characters with unique abilities.
9. Integrating character animation with special effects and post-production techniques.
10. Rigging a character for real-time use, such as for a video game or virtual reality experience.

Targeted Application & Tools that can be used

Blender

Project work/Assignment:

Assignment:

1. Modeling a simple, low-poly character and rigging it with a basic skeleton rig.
2. Experimenting with different rigging techniques, such as forward kinematics, inverse kinematics, and constraint-based rigging.
3. Rigging a character for basic body animations, such as walking, running, jumping, etc.
4. Rigging a character's face for simple facial expressions, such as smiling and frowning.
5. Integrating character animation with basic special effects, such as particle effects or light sources.

Text Book

T1 Oliver Villar, "Learning Blender: A Hands-On Guide to Creating 3D Animated Characters", Pearson, second edition, 2015.

References

1. 3D Totol Publisher, "beginner's Guide to Creating Characters in Blender Paperback", 3DTotal Publishing 2021.
2. Xury Greer "Sculpting the Blender Way: Explore Blender's 3D sculpting workflows and latest features, including Face Sets, Mesh Filters, and the Cloth brush", Packet Publishing, 2022.

E book link R1: a) https://www.classcentral.com/course/swayam-digital-land-surveying-and mapping-dls-m-7983

E book link R2 : https://animationresources.org/pics06/refpack021-advancedanimation.pdf

Web resources: https://www.blender.org/download/releases/3-2/

Topics relevant to "SKILL DEVELOPMENT": Blender user Interface, Character Design in Blender, Applying final touches to the Rig **for Skill Development** through **Experiential Learning techniques.** This is attained through assessment component mentioned in course handout.

Course Code: CSA3038	**Course Title: AR/VR based Game Development** **Type of Course: Discipline elective**		**L- T-P-C**	**1**	**0**	**4**	**3**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course on AR/VR based Game Development provides an in-depth exploration of the technologies, tools, and techniques used to create games and interactive experiences using augmented reality (AR) and virtual reality (VR) technologies. A comprehensive introduction to the programming concepts and techniques required for AR/VR game development, including 3D graphics programming, physics simulation, and networking is included. Students will also have an understanding of the development workflow for AR/VR games, from planning and design to deployment and optimization as well as obtain a hands-on experience designing and developing AR/VR games, using the skills and knowledge acquired in the course.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **AR/VR based Game Development** attain **Employability** through **Experiential Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Demonstrate the requirements for AR VR Game Production. [Understand] **CO2:** Develop Virtual Reality Experience and game [Apply] **CO3:** Build the AR based Game and Application using Game Engine. [Apply] **CO4:** Analyze the game mechanics from the feedback [Analyze]					
Course Content:						
Module 1	**Introduction to AR/VR Technologies and game design**	**Assignment**	**Research and write a report on AR/VR technologies and their current applications**	**25 Sessions**		
Topics: Overview of AR and VR technologies, applications, latest hardware, software requirements, Overview of AR/VR development tools and platforms, game design considerations, game design document, interaction design, level design, user experience design, game mechanics.						
Module 2	**VR Gaming & Experience**	**Case Study**	**Draw the Levels of VR game on paper**	**25 Sessions**		
Topics: The Geometry of Virtual Worlds - Light and Optics - Visual Rendering - Interaction - Evaluating VR Systems and Experiences – VR Game Development - Comfort and VR Sickness						
Module 3	**AR Gaming and Application**	**Assignment**	**Test and optimize an AR game and Application in Android/IoS**	**25 Sessions**		

Topics:

Vuforia Engine Integration -AR Setup – Targets and Anchors - AR Foundation - Scene setup- Subsystems- Managers – AR Application and Game Development

Targeted Application & Tools that can be used:

16. Setting Up an AR/VR Project in Unity
17. Creating and Deploying an AR Experience
18. Building an Interactive VR Environment
19. Implementing Object Manipulation in AR
20. Creating a VR-Based Teleportation System
21. Augmented Reality Image Tracking
22. Designing a VR First-Person Controller
23. AR-Based 3D Object Placement Game
24. Physics-Based Interactions in VR
25. Multiplayer AR Game Using Networked Components
26. AR Treasure Hunt Game
27. VR Escape Room Game
28. AR Tower Defense Game
29. VR Shooting Range Game
30. AR Basketball Game

Targeted Application & Tools that can be used:
Unity, Visual Studio

Project work/Assignment:

Assignment: 1] Report on AR/VR technologies and their current applications.
Project Assignment: 1] Test and optimize an AR/VR game

Text Book:

T1. LaValle, Steven M. *Virtual reality*. Cambridge university press, 2023.
T2. Tacgin, Z. (2020). *Virtual and augmented reality: an educational handbook*. Cambridge Scholars Publishing.

References:

R1 Macklin, C., & Sharp, J. (2016). *Games, Design and Play: A detailed approach to iterative game design*. Addison-Wesley Professional.
R2. E. Pangilinan, S. Lukas, V. Mohan, (2019), "Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", 1st Ed., O'Reilly Publications.

Web References:

- https://unity.com/solutions/xr/ar
- https://docs.unity3d.com/Packages/com.unity.xr.arfoundation@5.0/manual/index.html
-

Topics: Topics relevant to "EMPLOYABILITY SKILLS": VR user interaction methods, interaction design, level design, user experience design for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSA3013	Course Title: Video Streaming and Augmented Reality (AR) Technologies Type of Course: Discipline Elective	L-P-T-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	Nil					
Course Description	This course "Video Streaming and Augmented Reality (AR) Technologies" offers an in-depth exploration of two transformative domains revolutionizing the digital landscape. The students will acquire a robust understanding of video streaming's underlying principles, including video compression, streaming protocols, and adaptive bitrate streaming. They will also gain insights into Content Delivery Networks (CDNs) and their role in optimizing video delivery. The students will delve into the fundamental concepts, applications, and hardware devices shaping AR experiences. Hands-on practice with industry-leading tools such as Unity will empower students to design and develop interactive AR applications, along with 3D modeling, asset animation, and user interface design. By the course's conclusion, participants will be equipped to pioneer advancements in video streaming and AR, ready to contribute to the dynamic landscape of digital content delivery and immersive user experiences.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Video Streaming and Augmented Reality (AR) Technologies** and attain **Employability Skills** through **Problem Solving Methodologies**					
Course Out Comes	On successful completion of the course the students shall be able to: 4. Summarize latest video streaming technologies. 5. Construct interactive AR applications using Unity. 6. Demonstrate the integration of video streaming and AR applications into web applications.					
Course Content:						
Module 1	Fundamentals of Video Streaming	Assignment	Case Study		**02+08 Hours**	
Topics: Overview of video streaming and its significance. Video compression techniques and their impact on streaming quality, video compression techniques and their impact on streaming quality. Introduction to Adaptive Bitrate Streaming (ABR), ABR best practices and considerations for different devices and platforms and Content Delivery Networks (CDNs) for Video Streaming, integrating video streaming with CDNs for enhanced performance and scalability, Analyzing CDN performance metrics and troubleshooting common issues [Blooms 'level selected**: Understanding**]						

Module 2	Augmented Reality (AR) Technologies	Assignment	Programming	**3+12 Hours**
Topics: Introduction to Augmented Reality and its applications, types of AR applications, devices and hardware. Introduction to Unity and AR Foundation for AR application development, Unity and AR Foundation for AR application development, Animating AR assets and designing immersive user interfaces, Implementing user interactions and gestures in AR applications. [Blooms 'level selected: **Applying**]				
Module 3	Implementing user interactions and gestures in AR applications	Assignment	Programming/Problem Solving	**3+12Hours**
Topics: Implementing user interactions and gestures in AR applications using HTML5 video tags, Integrating WebRTC for real-time video communication, secure video streaming through encryption, AR Cloud and persistent AR experiences, AR for location-based services and navigation applications, AR games and interactive experiences. Future trends and innovations in video streaming and AR technologies. [Blooms 'level selected: **Understanding**]				

List of Laboratory Tasks:

Experiment No 1: Video Compression and Quality Analysis. **[2 hours: Application Level]**
Level 1: Use different video compression and bandwidth settings on a sample video
Level 2: Analyze the trade-offs between video quality and bandwidth requirements for adaptive bitrate streaming

Experiment No. 2: Implement adaptive bitrate streaming algorithms. **[2 hours: Application Level]**

Level 1: Use of Rate Adaptation Algorithms.
Level 2: Measure the dynamic adaptation of video quality in response to network fluctuations

Experiment No. 3: Evaluate the performance of Content Delivery Networks (CDNs) in video streaming.
[4 hours: Application Level]

Level 1: Host video content on the local CDN and measure video delivery performance
Level 2: Compare the performance of the local CDN with direct video hosting.

Experiment No. 4: Troubleshooting Video Streaming Issues. **[2 hours: Application Level]**
Level 1: Resolve simulated video streaming issues like buffering, stuttering, and latency.
Level 2: Verify the effectiveness of the troubleshooting measures through retesting.

Experiment No. 5: To design and implement AR applications. **[4 hours: Application Level]**
Level 1: Implement interactive elements such as buttons, menus, and touch gestures.
Level 2: Assess Feedback to make improvements based on feedback.

Experiment No. 6: To explore and compare marker-based and marker-less AR technologies. **[4 hours: Application Level]**

Level 1: Develop two AR applications, one using marker-based AR and the other using marker-less AR.
Level 2: Compare the performance of the applications under various conditions.

Experiment No. 7: Deploy AR applications on various platforms. **[2 hours: Application Level]**
Level 1: Adapt their AR applications for Android and iOS devices.
Level 2: Test and optimize the applications on different smartphones.

Experiment No.8: Implement WebRTC for Real-time Video Communication. **[2 hours: Application Level]**
Level 1: Develop a web application that allows real-time video communication.
Level 2: Test the application's performance and evaluate the quality.

Experiment No.9: Implement Secure Video Streaming with DRM. **[2 hours: Application Level]**
Level 1: Implement secure video streaming with DRM in a web application
Lever 2: Evaluate the effectiveness of DRM in preventing unauthorized video access.

Experiment No.10: Creating AR Cloud and Persistent AR Experiences. **[4 hours: Application Level]**
Level 1: Design an AR application that utilizes AR Cloud technology.
Lever 2: Test the AR application's ability to maintain persistent AR experiences under various conditions.

Targeted Application & Tools that can be used:

Application Area is to understand and apply concept of object oriented concepts using C#, HTML5, JavaScript and Python.
Tools/Simulator used: OBS Studio, VLC, Media Player, Unity.

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

3. **Project work: Analyze and optimize video streaming performance using various techniques.**
4. **Programming: Design and develop an interactive augmented reality application**

Text Book

2. Eli Noam, "The Technology, Business, and Economics of Streaming Video: The Next Generation of Media Emerges", Edward Elgar Publishing, 1st Edition, 2021.
3. **Nicolas Alejandro Borromeo , "Hands-On Unity 2022 Game Development", Packt Publishing, 1st edition, 2022.**

References

1. **David Austerberry, "The Technology of Video and Audio Streaming", Routledge publication, 2nd Edition, 2004.**
2. **Bjarne Stroustrup, "The C++ Programming Language", Pearson Education, 2004.**
3. **Casie Hardman, "Game Programming with Unity and C#: A Complete Beginner's Guide", Apress Publication, 2020.**

Topics relevant to "EMPLOYABILITY SKILLS": C#, CDN, Unity, Solving real time Problems & Data collection for an assignment. For attaining **Employability Skill** through **Problem Solving** Mentodologies. This is attained through assessment component mentioned in course handout

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