



B.S. Abdur Rahman™

Crescent

Institute of Science & Technology

Deemed to be University u/s 3 of the UGC Act, 1956

*Regulations 2021
Curriculum and Syllabi
(Updated upto September 2024,
as per 22nd Academic Council)*

Bachelor of Computer Applications



REGULATIONS 2021

CURRICULUM AND SYLLABI

(Updated upto September 2024, as per 22nd Academic Council)

BACHELOR OF COMPUTER APPLICATIONS

VISION AND MISSION OF THE INSTITUTION

VISION

B.S.Abdur Rahman Crescent Institute of Science and Technology aspires to be a leader in Education, Training and Research in multidisciplinary areas of importance and to play a vital role in the Socio-Economic progress of the Country in a sustainable manner.

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through Quality and Value-Based Education.
- To promote Professional Leadership and Entrepreneurship.
- To achieve excellence in all its endeavors to face global challenges.
- To provide excellent teaching and research ambience.
- To network with global Institutions of Excellence, Business, Industry and Research Organizations.
- To contribute to the knowledge base through Scientific Enquiry, Applied Research and Innovation.

DEPARTMENT OF COMPUTER APPLICATION

VISION AND MISSION

VISION

Aspires to provide quality education in the field of computer applications with state-of-the-art computational facilities and undertake quality research in collaboration with industries and universities to produce committed professionals and academicians to meet the needs of the industries and society.

MISSION

- To disseminate knowledge through education and training of graduates in the field of computer applications.
- To focus on teaching - learning, research and consultancy to promote excellence in computer applications.
- To foster graduates with opportunities required to explore, create and face challenges of IT related industries.
- To equip the graduates with the necessary skills in communication, team work and leadership qualities to meet the needs of the IT related sector globally.
- To disseminate the outcome of projects and research work undertaken by the department through appropriate measures for the benefit of society and industry.

PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES

BACHELOR OF COMPUTER APPLICATIONS

PROGRAMME EDUCATIONAL OBJECTIVES

PEO-1: To give good foundation in mathematics and computing sciences for acquiring computational knowledge level understanding of systems modeling and algorithm development.

PEO-2: To give technical knowledge in various high-level and systems level programming languages to comprehend, analyze, design and create innovative computing solutions for information technology projects.

PEO-3: To empower the students for self learning by providing quality environment to upgrade their skill in creating and maintaining data centers, system resources and infrastructure for the organizations in their information technology projects.

PEO-4: To create awareness in the young minds of the students and motivate them to qualify academically with further studies with research acumen and serve the society with creative ideas and inventions.

PROGRAMME OUTCOMES

PO1: Computational knowledge for mathematical and systems modeling through effective teaching and learning processes.

PO2: Prepare requirement engineering metrics with scientific diagrams for system software/application software product development.

PO3: Design and development to solution methodologies and implementation of simple computational algorithms.

PO4: Conduct literature survey and summarize the inferences from the authentic resources.

PO5: Ability to select appropriate software tools for development as well as testing for successful implementation.

PO6: Become a software professional with social responsibilities and ethical values.

PO7: Provide the necessary skill set to solve societal and environmentally sensitive problems in professional manner.

PO8: Manage technology and configuration change management in the working places.

PO9: Function as individual member or leader of team and able to manage projects in the software development and project automation process

PO10: Comprehend and write effective project reports.

PO11: Improve professional affiliation with national and international societies and additional certifications through self learning mode.

PO12: Be come an entrepreneur with enterprising attitude and serve the society.

PROGRAMME SPECIFIC OUTCOMES

PSO1: To enrich the graduates with necessary design and development skills for exclusive systems oriented or application software products.

PSO2: To enhance the productivity level in providing software automation skills with computer and mobile network specialization.

REGULATIONS - 2021**B.A. / BBA/ B.Com. / BCA / B.Sc. DEGREE PROGRAMMES*****(Under Choice Based Credit System)***

(Amendments Approved by the 22nd Academic Council – September 2024)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

- i) **"Programme"** means B.A. / BBA / BCA / B.Com. / B.Sc. Degree Programmes.
- ii) **"Course"** means theory / practical / laboratory integrated theory / seminar / internship / project and any other subject that is normally studied in a semester like English, Mathematics, Environmental Science, etc.,
- iii) **"Institution"** means B.S. Abdur Rahman Crescent Institute of Science and Technology.
- iv) **"Academic Council"** means the Academic Council, which is the apex body on all academic matters of this Institute.
- v) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of the Institution who is responsible for the implementation of relevant rules and regulations for all the academic activities.
- vi) **"Dean (Student Affairs)"** means the Dean (Students Affairs) of the Institution who is responsible for activities related to student welfare and discipline in the campus.
- vii) **"Controller of Examinations"** means the Controller of Examination of the Institution who is responsible for the conduct of examinations and declaration of results.
- viii) **"Dean of the School"** means the Dean of the School of the department concerned.
- ix) **"Head of the Department"** means the Head of the Department concerned.

2.0 PROGRAMMES OFFERED AND ELIGIBILITY CRITERIA FOR ADMISSION**2.1 UG Programmes Offered**

Degree	Mode of Study
B.A.	FullTime
BBA	
B.Com.	
BCA	
B.Sc.	

2.2 Eligibility Criteria

Students for admission to the first semester of the undergraduate degree programme must have passed the Higher Secondary Examination of the 10 +2 curriculum (Academic stream) or any other examination of any authority accepted by this Institution as equivalent thereto.

S.No.	Programme	Eligibility Criteria
1	BCA	10+2 (Higher Secondary) with Mathematics or equivalent subject
2	B.Sc. Computer Science	10+2 (Higher Secondary) with Mathematics or equivalent subject
3	B.Sc. Biotechnology	10+2 (Higher Secondary) with Chemistry and Biology as subjects
4	BBA (Financial Services)	10+2 (Higher Secondary)
5	BBA (General)	
6	B.Com. (General)	10+2 (Higher Secondary) with Mathematics, Physics and Chemistry / Physics, Chemistry, Botany and Zoology / Commerce / Statistics as subjects.
7	B.Com (Accounts and Finance)	
8	B.Com. (Hons.)	
9	B.A. English (Hons.)	10 +2 (Higher Secondary)
10	B.A. Islamic Studies	
11	B.A. Public Policy	

2.4 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the Institution in adherence to the guidelines of regulatory / statutory authorities from time to time.

3.0 STREAMS / SPECIALISATION OF STUDY

The following are the details of specialization / streams offered in various programmes:

S.No.	Program	Streams / Specialisation of Study
1.	BCA	i. Cloud Technology and Information Security ii. Data Science iii. Multimedia and Web Application Development iv. Artificial Intelligence v. Cyber Security
2.	B.Sc.	i. Computer Science ii. Biotechnology
3.	BBA	i. General ii. Financial Services
4.	B.Com	i. General ii. Honours iii. Accounts and Finance
5.	B.A.	i. English (Honours) ii. Islamic Studies iii. Public Policy

4.0 STRUCTURE OF THE PROGRAMME

4.1 The curriculum of the UG programmes consists of the following components:

- Core Courses (CC)
- Allied Courses (AC)
- Ability Enhancement Courses (AEC)
- Skill Enhancement Courses (SEC)
- Elective Courses (EC)
- Laboratory Courses (LC)
- Laboratory Integrated Theory Courses (LITC)
- Value added courses
- Mandatory courses (MC)
- Project - PROJ (Project work, seminar, and internship in industry or at appropriate workplace)

4.1.1 Personality and Character Development

All students shall enroll, on admission, in any of the following personality and character development programmes:

- National Cadet Corps (NCC)
- National Service Scheme (NSS)
- National Sports Organization (NSO)
- Youth Red Cross (YRC)
- Rotaract
- Crescent Indian Society Training Development (ISTD – C)
- Crescent Creative Strokes
- Crescent Technocrats Club

The training activities / events / camp shall normally be organized during the weekends / vacation period.

4.1.2 Online Courses for Credit Transfer

Students are permitted to undergo department approved online courses under SWAYAM up to 40% of credits of courses in a semester excluding project semester (if any) with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

4.1.3 Value Added Courses

The students are permitted to pursue department approved online courses (excluding courses registered for credit transfer) or courses offered / approved by the department as value added courses.

The details of the value added course viz., syllabus, schedule of classes and the course faculty shall be sent to Dean, Academic Affairs for approval. The students may also undergo the valued added course offered by other departments with the consent of the Head of the Department offering the course.

These value added courses shall be specified in the consolidated mark sheet as additional courses pursued by the student over and above the curriculum during the period of study.

4.1.4 Industry Internship

The students shall undergo training for a period as specified in the curriculum during the summer vacation in any industry relevant to the field study.

The students are also permitted to undergo internship at a research organization / eminent academic institution for the period prescribed in the curriculum during the summer vacation, in lieu of Industrial training.

In any case, the student shall obtain necessary approval from the Head of the Department / Dean of School and the training has to be taken up at a stretch.

4.1.5 Industrial Visit

The student shall undergo at least one industrial visit every year. The Heads of Departments / Deans of Schools shall ensure the same.

4.2 Each course is normally assigned certain number of credits:

- One credit per lecture period per week
- One credit per tutorial period per week
- One credit for two to three periods and two credits for four periods of laboratory or practical sessions per week
- One credit for two periods of seminar / project work per week
- One credit for two weeks of industrial training or 80 hours per semester.

4.3 Each semester curriculum shall normally have a blend of lecture courses, laboratory courses, laboratory integrated theory courses, etc.

4.4 For successful completion of the programme, a student must earn a minimum total credit specified in the curriculum of the respective programme of study.

4.5 The medium of instruction, examinations and project report shall be English, except B.A. Islamic Studies (Arabic medium) and for courses in languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is expected to complete the programme in 6 semesters but in any case not more than 10 continuous semesters reckoned from the date of first admission.

5.2 Each semester shall consist of a minimum of 90 working days including the days of examinations.

5.3 The maximum duration for completion of the programme as mentioned in clause 5.1 shall also include period of break of study vide clause 7.1 so that the student may be eligible for the award of the degree.

6.0 REGISTRATION AND ENROLLMENT

6.1 The students of first semester shall register and enroll for courses at the time of admission by paying the prescribed fees. For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous semester.

6.2 A student can enroll for a maximum of **38 credits** during a semester including Redo / Predo Courses.

6.3 Change of Course

A student can change an enrolled course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department / Dean of School of the student.

6.4 Withdrawal from a Course

A student can withdraw from an enrolled course at any time before the first continuous assessment test for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department / Dean of School of the student.

7.0 BREAK OF STUDY FROM PROGRAMME

7.1 A student may be allowed / enforced to take a break of study for two semesters from the programme with the approval of Dean (Academic Affairs) for the following reasons:

7.1.1 Medical or other valid grounds

7.1.2 Award of 'I' grade in all the courses in a semester due to lack of attendance

7.1.3 Debarred due to any act of indiscipline.

7.2 The total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 5.1).

- 7.3** A student who has availed break of study in the current semester (odd/even) can rejoin only in the subsequent corresponding (odd/even) semester in the next academic year on approval from Dean, Academic affairs.
- 7.4** During the break of study, the student shall not be allowed to attend any regular classes or participate in any activities of the institution. However he / she shall be permitted to enroll for the 'I' grade courses and appear for the arrear examinations.

8.0 CLASS ADVISOR AND FACULTY ADVISOR

8.1 Class Advisor

A faculty member will be nominated by the Head of the Department / Dean of School as class advisor for the class throughout the period of study.

The class advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class.

8.2 Faculty Advisor

To help the students in planning their courses of study and for general counseling, the Head of the Department / Dean of School of the students will attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisors shall guide the students in taking up the elective courses for registration and enrolment in every semester and also offer advice to the students on academic and related personal matters.

9.0 COURSE COMMITTEE

- 9.1** Each common theory course offered to more than one group of students shall have a "Course Committee" comprising all the course faculty teaching the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending on whether all the course faculty teaching the common course belong to a single department or from several departments. The course committee shall ensure preparation of a common question paper and scheme of

evaluation for the tests and semester end examination.

10.0 CLASS COMMITTEE

A class committee comprising faculty members handling the courses, student representatives and a senior faculty member not handling the courses as chairman will be constituted semester-wise by the Head of the Department.

10.1 The composition of the class committee will be as follows:

- One senior faculty member preferably not handling courses for the concerned semester, appointed as chairman by the Head of the Department.
- All the faculty members handling courses of the semester.
- Six student representatives (male and female) of each class nominated by the Head of the Department in consultation with the relevant faculty advisors.
- All faculty advisors and the class advisors
- Head of the Department - Ex-Officio Member

10.2 The class committee shall meet at least three times during the semester. The first meeting shall be held within two weeks from the date of commencement of classes, in which the components of continuous assessment for various courses and the weightages for each component of assessment shall be decided for the first and second assessment. The second meeting shall be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

10.3 During these two meetings the student members shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum, and syllabi, etc.

10.4 The third meeting of the class committee, excluding the student members, shall meet after the semester end examinations to analyse the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the course faculty concerned.

11.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

11.1 Every theory course shall normally have a total of three assessments during a semester as given below:

Assessments	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 6	1.5 hours	25%
Assessment 2	7 to 12	1.5 hours	25%
Semester End Examination	Full course	3 hours	50%

11.2 Theory Course

Appearing for semester end theory examination for each course is mandatory and a student shall secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

11.3 Laboratory Course

Every practical course shall have 60% weightage for continuous assessments and 40% for semester end examination. However, a student shall have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

11.4 Laboratory integrated theory courses

For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical components. Grading shall be done for this consolidated mark. Assessment of theory components shall have a total of three assessments with two continuous assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in the semester end theory examination. The evaluation of practical components shall be through continuous assessment.

11.5 The components of continuous assessment for theory / practical / laboratory integrated theory courses shall be finalized in the first class committee meeting.

11.6 Industry Internship

In the case of industry internship, the student shall submit a report, which shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research / academic organisation. The weightage of marks for industry internship report and viva voce examination shall be 60% and 40% respectively.

11.7 Project Work

In the case of project work, a committee of faculty members constituted by the Head of the Department / Dean of the School shall carry out three periodic reviews. Based on the project report submitted by the students, an oral examination (viva voce) shall be conducted as semester end examination by an external examiner approved by the Controller of Examinations. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the viva voce examination.

11.8 Assessment of seminars and comprehension shall be carried out by a committee of faculty members constituted by the Head of the Department.

11.9 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance shall be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during course of study shall become invalid.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. There shall be no arrear or improvement examination for lab components.

12.0 SUBSTITUTE EXAMINATIONS

- 12.1** A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of the School for that purpose. There is no substitute examination for semester end examination.
- 12.2** A student shall apply for a substitute exam in the prescribed form to the Head of the Department / Dean of the School within a week from the date of assessment test. However, the substitute examination will be conducted only after the last instructional day of the semester.

13.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

- 13.1** A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% to become eligible to appear for the semester end examination in that course, failing which the student shall be awarded "I" grade in that course.
- 13.2** The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in the concerned course to the class advisor. The class advisor shall consolidate and furnish the list of students who have earned less than 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department/ Dean of the School. Thereupon, the Dean (Academic Affairs) shall officially notify the names of such students prevented from writing the semester end examination in each course.
- 13.3** If a student secures attendance between 65% and less than 75% in any course in a semester, due to medical reasons (hospitalization / accident / specific illness) or due to participation in the institution approved events, the student shall be given exemption from the prescribed attendance requirement and the

student shall be permitted to appear for the semester end examination of that course. In all such cases, the students shall submit the required documents immediately after joining the classes to the class advisor, which shall be approved by the Head of the Department / Dean of the School. The Vice Chancellor, based on the recommendation of the Dean (Academic Affairs) may approve the condonation of attendance.

- 13.4** A student who has obtained an “I” grade in all the courses in a semester is not permitted to move to the next higher semester. Such students shall repeat all the courses of the semester in the subsequent academic year.
- 13.5** The student awarded “I” grade, shall enroll and repeat the course when it is offered next. In case of “I” grade in an elective course either the same elective course may be repeated, or a new elective course may be taken with the approval of Head of the Department / Dean of the School.
- 13.6** A student who is awarded “U” grade in a course shall have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to redo the course in the evening when the course is offered by the department. Marks scored in the continuous assessment in the redo course shall be considered for grading along with the marks scored in the semester end (redo) examination. If any student obtains “U” grade in the redo course, the marks scored in the continuous assessment test (redo) for that course shall be considered as internal mark for further appearance of arrear examination.
- 13.7** If a student with “U” grade, who prefers to redo any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she is not permitted to write the semester end examination and his / her earlier “U” grade and continuous assessment marks shall continue.

14.0 REDO COURSES

- 14.1** A student can register for a maximum of three redo courses per semester without affecting the regular semester classes, whenever such courses are offered by the concerned department, based on the availability of faculty members and

subject to a specified minimum number of students registering for each of such courses.

- 14.2** The number of contact hours and the assessment procedure for any redo course shall be the same as regular courses, except there is no provision for any substitute examination and withdrawal from a redo course.

15.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

- 15.1** All assessments of a course shall be made on absolute marks basis. The class committee without the student members shall meet to analyse the performance of students in all assessments of a course and award letter grades following the relative grading system. The letter grades and the corresponding grade points are as follows:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
W	-
I	-

"W" - denotes withdrawal from the course.

"I" - denotes inadequate attendance in the course and prevention from appearance of semester end examination

"U" - denotes unsuccessful performance in the course.

- 15.2** A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.

- 15.3** Upon awarding grades, the results shall be endorsed by the chairman of the class committee and Head of the Department / Dean of the School. The Controller of Examination shall further

approve and declare the results.

15.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer scripts of one or more courses, on payment of prescribed fee, through proper application to the Controller of Examinations. Subsequently the Head of the Department/ Dean of the School offered the course shall constitute a revaluation committee consisting of chairman of the class committee as convener, the faculty member of the course and a senior faculty member having expertise in that course as members. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

15.5 After results are declared, grade sheets shall be issued to each student, which contains the following details: a) list of courses enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

If C_i is the number of credits assigned for the i^{th} course and GP_i is the Grade Point in the i^{th} course,

$$GPA = \frac{\sum_{i=1}^n (C_i)(GP_i)}{\sum_{i=1}^n C_i}$$

Where n = number of courses

The Cumulative Grade Point Average (CGPA) is calculated in a similar manner, considering all the courses enrolled from the first semester.

"I" and "W" grades are excluded for calculating GPA.

"U", "I" and "W" grades are excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage equivalent of marks = $CGPA \times 10$

15.6 After successful completion of the programme, the degree shall be awarded to the students with the following classifications based on CGPA.

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within the prescribed period of six semesters.
First Class	6.50 and above, having completed within a period of eight semesters.
Second Class	Others

15.6.1 Eligibility for First Class with Distinction

- A student should not have obtained “U” or “I” grade in any course during his/her study.
- A student should have completed the UG programme within the minimum prescribed period of study (except clause 7.1.1)

15.6.2 Eligibility for First Class

- A student should have passed the examination in all the courses not more than two semesters beyond the minimum prescribed period of study (except clause 7.1.1)

15.6.3 The students who do not satisfy clause 15.6.1 and clause 15.6.2 shall be classified as second class.

15.6.4 The CGPA shall be rounded to two decimal places for the purpose of classification. The CGPA shall be considered up to three decimal places for the purpose of comparison of performance of students and ranking.

16.0 SUPPLEMENTARY EXAMINATION

Final year students and passed out students can apply for supplementary examination for a maximum of three courses thus providing an opportunity to complete their degree programme. The students can apply for supplementary examination within three weeks of the declaration of results in the even semester.

17.0 DISCIPLINE

17.1 Every student is expected to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

17.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the Head of the Department / Dean of the School concerned shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action. This committee shall also address the grievances related to the conduct of online classes.

18.0 ELIGIBILITY FOR THE AWARD OF DEGREE

18.1 A student shall be declared to be eligible for the award of B.A. / BBA / BCA / B.Com. / B.Sc. degree provided the student has:

- i) Successfully earned the required number of total credits as specified in the curriculum of the programme of study within a maximum period of 10 semesters from the date of admission, including break of study.
- ii) Successfully completed the requirements of the enrolled professional development activity.
- iii) No dues to the Institution, Library, Hostel, etc.
- iv) No disciplinary action pending against him/her.

18.2 The award of the degree must have been approved by the Institution.

19.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.

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SEMESTER I							
Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	AEC	END 1183	GeneralEnglish-I	3	0	0	3
2.	HC	LND 1181	General Tamil – I	2	1	0	3
		LND 1182	German – I	2	1	0	3
		LND 1183	Arabic Language	3	0	0	3
3.	AC	MAD 1187	Algebra and Numerical Methods	3	1	0	4
4.	CC	CAD 1101	Computer Fundamentals and Organization	3	0	0	3
5.	CC	CAD 1102	ProgramminginC	3	0	0	3
6.	CC	CAD 1103	Data Structures	3	0	0	3
7.	LC	CAD 1104	ProgramminginCLaboratory	0	0	4	2
8.	LC	CAD 1105	Data Structures Laboratory	0	0	4	2
Total Credits							23

SEMESTER II							
Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	AEC	END 1283	GeneralEnglish-II	3	0	0	3
2.	HC	LND 1281	General Tamil - II	2	1	0	3
		LND 1282	German - II	3	0	0	3
		LND 1283	Modern Communicative Arabic	3	0	0	3
3.	AC	MAD 1288	Probabilityand Statistics	3	1	0	4
4.	CC	CAD 1201	OOPSwithC++	3	0	0	3
5.	CC	CAD 1202	OperatingSystems	3	0	0	3
6.	MC	GED 1207	Environmental Studies	2	0	0	2
7.	LC	CAD 1203	OOPSwithC++Laboratory	0	0	4	2
8.	LC	CAD 1204	LinuxLaboratory	0	0	4	2
Total Credits							22

SEMESTER III

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	CAD 2101	Design and Analysis of Algorithms	3	0	0	3
2.	CC	CAD 2102	Software Engineering	3	0	0	3
3.	CC	CAD 2103	Relational Database Management System	3	0	0	3
4.	CC	CAD 2104	Computer Networks	3	0	0	3
5.	SEC	CAD 2105	Programming in Java	3	0	0	3
6.	EC		TechnologyCore I	3	0	0	3
7.	LC	CAD 2106	Relational Database Management System Laboratory	0	0	4	2
8.	LC	CAD 2107	Programming in Java Laboratory	0	0	4	2
9.	SEC	GED 2102	Aptitude and Interpersonal Skills	0	0	2	1
Total Credits							23

SEMESTER IV

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1	CC	CAD 2201	Python Programming	3	0	0	3
2	OEC		Open Elective	3	0	0	3
3	CC		TechnologyCore II	3	0	0	3
4	CC		TechnologyCore III	3	0	0	3
5	CC		TechnologyCore IV	3	0	0	3
6	EC		Programme Elective-I	3	0	0	3
7	LC	CAD 2203	Python Programming Laboratory	0	0	4	2
8	LC		TechnologyCore Lab-I	0	0	4	2
9	SEC	GED 2204	Aptitude and Workplace Skills	0	0	2	1
Total Credits							23

SEMESTER V

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1.	CC	CAD 3101	Logical Reasoning and Thinking	3	0	0	3
2.	CC	CAD 3108	FullStack Technologies	3	0	2	4
3.	CC		TechnologyCoreV	3	0	0	3
4.	CC		TechnologyCore VI	3	0	0	3
5.	CC		TechnologyCore VII	3	0	0	3
6.	EC		Programme Elective-II	3	0	0	3
7.	LC		TechnologyCoreLab-II	0	0	4	2
8.	LC		TechnologyCoreLab-III	0	0	4	2
9.	SEC		Personality Development Skills	0	0	0	0
Total Credits				23			

SEMESTER VI

Sl. No.	Course Group	Course Code	CourseTitle	L	T	P	C
1	CC	CAD 3201	Enterprise Application Development	3	0	0	3
2	PROJ	CAD 3202	Project Work	0	0	0	12
3	CC		TechnologyCore VIII	3	0	0	3
Total Credits							18

OverallTotalCredits-132

LIST OF TECHNOLOGY CORE COURSES (SEMESTER III)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	CADX 101	Introduction to Cloud Technology (CTIS)	3	0	0	3
2.	CADX 103	Introduction to Data Science (DS)	3	0	0	3
3.	CADX 104	Multimedia Tools and Techniques (MM)	3	0	0	3
4.	CADX 122	Introduction to Artificial Intelligence (AI)	3	0	0	3
5.	CADX 128	Introduction to Cyber security (CS)	3	0	0	3

LIST OF TECHNOLOGY CORE COURSES (SEMESTER IV)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	CADX 201	Information Security Fundamentals (CTIS)	3	0	0	3
2.	CADX 202	Business Intelligence (DS)	3	0	0	3
3.	CADX 203	Introduction to Scripting Languages (MM)	3	0	0	3
4.	CADX 219	Introduction to Machine Learning Techniques (AI)	3	0	0	3
5.	CADX 224	Ethical Hacking (CS)	3	0	0	3
6.	CADX 204	Web Technology (MM)	3	0	0	3
7.	CADX 205	Server Operating System (CTIS)	3	0	0	3
8.	CADX 207	Big Data Analytics (DS)	3	0	0	3
9.	CADX 220	Digital Image Processing (AI)	3	0	0	3
10.	CADX 225	Web and Mobile Application Security (CS)	3	0	0	3
11.	CADX 212	Fundamentals of Datacenter (CTIS)	3	0	0	3
12.	CADX 214	Exploratory Data Analysis (DS)	3	0	0	3

BCA	Bachelor of Computer Applications		Regulations 2021			
13.	CADX 225	Web and Mobile Application Security	3	0	0	3
14.	CADX 215	Computer Graphics(MM)	3	0	0	3
15.	CADX 221	Knowledge Engineering (AI)	3	0	0	3
16.	CADX 226	Cryptography and Network Security(CS)	3	0	0	3

LIST OF TECHNOLOGY CORE LAB I (SEMESTER IV)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	CADX 209	Server Operating System Laboratory(CTIS)	0	0	4	2
2.	CADX 208	Web Technology Laboratory(MM)	0	0	4	2
3.	CADX 211	Big Data Analytics Laboratory(DS)	0	0	4	2
4.	CADX 222	Digital Image Processing Laboratory(AI)	0	0	4	2
5.	CADX 227	Ethical Hacking Lab(CS)	0	0	4	2

LIST OF TECHNOLOGY CORE COURSES (SEMESTER V)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	CADX105	Computer Forensics and Investigation(CTIS& CS)	3	0	0	3
2.	CADX106	Machine Learning Algorithms (DS)	3	0	0	3
3.	CADX 107	Games, Art and Design (MM)	3	0	0	3
4.	CADX 123	Introduction to Deep Learning	3	0	0	3
5.	CADX108	Cloud Service for Data Science(DS)	3	0	0	3
7.	CADX109	Virtualization and Cloud Security(CTIS)	3	0	0	3
8.	CADX110	XML and Web Services (MM)	3	0	0	3

9.	CADX 124	Computer Vision (AI)	3	0	0	3
10.	CADX 111	Principles of Virtualization(CTIS)	3	0	0	3
11.	CADX 113	Time Series Analysis(DS)	3	0	0	3
12.	CADX 114	Specialization in 3D Productions (MM)	3	0	0	3
13.	CADX 125	Natural Language Processing (AI)	3	0	0	3
14.	CADX 129	Information Security Fundamentals (CS)	3	0	0	3
15.	CADX 130	Blockchain Technology (CS)	3	0	0	3

LIST OF TECHNOLOGY CORE LAB II(SEMESTER V)

Sl. No.	CourseCode	CourseTitle	L	T	P	C
1.	CADX 115	Computer Forensics and Investigation Laboratory (CTIS& CS)	0	0	4	2
2.	CADX 116	Machine Learning Algorithms Laboratory(DS)	0	0	4	2
3.	CADX 117	AnimationLaboratory(MM)	0	0	4	2
4.	CADX 126	Computer Vision Laboratory (AI)	0	0	4	2

LIST OF TECHNOLOGY CORE LAB III (SEMESTER V)

Sl. No.	CourseCode	CourseTitle	L	T	P	C
1.	CADX 118	Cloud Services for Data Science Laboratory(DS)	0	0	4	2
2.	CADX 119	Virtualization Laboratory(CTIS)	0	0	4	2
3.	CADX 121	XML and Web Services Laboratory(MM)	0	0	4	2

BCA	Bachelor of Computer Applications			Regulations 2021			
4.	CADX 127	Natural Language Processing Laboratory (AI)	0	0	4	2	
5.	CADX 131	Information SecurityLaboratory(CS)	0	0	4	2	

LIST OF TECHNOLOGY CORE COURSES (SEMESTER VI)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	CADX 216	IT Governance, Risk and Information Security Management (CTIS)	3	0	0	3
2.	CADX 217	Data Science Project Management (DS)	3	0	0	3
3.	CADX 218	Web and E-Business (MM)	3	0	0	3
4.	CADX 223	Intelligent Systems (AI)	3	0	0	3
5.	CADX 228	Cyber Law (CS)	3	0	0	3

LIST OF PROGRAMME ELECTIVE COURSES

Sl. No.	Course Code	CourseTitle	L	T	P	C
PROGRAMME ELECTIVES – I						
1	CADX 250	E-Commerce	3	0	0	3
2	CADX 251	Information Retrieval	3	0	0	3
3	CADX 252	Social Media Analysis	3	0	0	3
4	CADX 253	Online Advertisement	3	0	0	3
5	CADX 254	PHP Programming	3	0	0	3
6	CADX 255	Fundamentals of Blockchain	3	0	0	3
7	CADX 256	Introduction to Data Analytics	3	0	0	3
PROGRAMME ELECTIVES – II						
1	CADX 150	Healthcare Analytics	3	0	0	3
2	CADX 151	Agile Methodology	3	0	0	3
3	CADX 152	Human Resource Analytics	3	0	0	3
4	CADX 153	Web Mining	3	0	0	3
5	CADX1 54	Human Computer Interaction	3	0	0	3
6	CADX 155	Artificial Intelligence	3	0	0	3
7.	CADX 156	Fundamentals of Data Science	3	0	0	3

**OPEN ELECTIVE COURSES FOR BA/ BBA / B.Com./ BCA/ B.Sc.
PROGRAMMES R 2021**

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1.	GEDX 301	Accounting and Financial Management	3	0	0	3	Commerce
2.	GEDX 302	AI for E-Commerce	3	0	0	3	ECE
3.	GEDX 303	Basics of Management and Organizational Behaviour	3	0	0	3	CSB
4.	GEDX 304	Behavioural Psychology	3	0	0	3	SSSH
5.	GEDX 305	Big Data Analytics	3	0	0	3	CA
6.	GEDX 306	Building Repair Solutions	3	0	0	3	Civil
7.	GEDX 307	Cloud Services and Management	3	0	0	3	CA
8.	GEDX 308	Computer Fundamentals and Office Automation	2	0	2	3	CA
9.	GEDX 309	Consumer Electronics	3	0	0	3	ECE
10.	GEDX 310	Creative Writing	2	1	0	3	English
11.	GEDX 311	Customer Relationship Management Analytics	3	0	0	3	CA
12.	GEDX 312	Cyber Law and Ethics	3	0	0	3	CSL
13.	GEDX 313	Disaster Management	3	0	0	3	Civil
14.	GEDX 314	Drone Technologies	2	0	2	3	Aero
15.	GEDX 315	English for Competitive Examination	2	1	0	3	English
16.	GEDX 316	Enterprise Risk Management	3	0	0	3	CSB
17.	GEDX 317	Fundamentals of Project Management	3	0	0	3	CSB
18.	GEDX 318	Genetic Engineering	3	0	0	3	SLS
19.	GEDX 319	Green Design and Sustainability	3	0	0	3	Civil
20.	GEDX 320	Industrial Safety	3	0	0	3	Mech.
21.	GEDX 321	Internet of Things and Its Applications	3	0	0	3	ECE
22.	GEDX 322	Introduction to Health Care Analytics	3	0	0	3	CA
23.	GEDX 323	IPR and Patent Laws	3	0	0	3	CSB
24.	GEDX 324	Logistics and Supply Chain Management	3	0	0	3	CSB
25.	GEDX 325	Motor Vehicle Act and Loss Assessment	3	0	0	3	Automobile
26.	GEDX 326	National Service Scheme	3	0	0	3	SSSH
27.	GEDX 327	National Cadet Corps	3	0	0	3	SSSH

BCA	Bachelor of Computer Applications				Regulations 2021		
28	GEDX 328	Numerical Computational Tools for Engineers	2	0	2	3	EIE
29	GEDX 329	Organizational Behaviour	3	0	0	3	CA
30	GEDX 330	Personal Finance and Investment	3	0	0	3	Commerce
31	GEDX 331	Polymers for Emerging Technologies	3	0	0	3	Polymer
32	GEDX 332	Professional Ethics and Values	3	0	0	3	SSSH
33	GEDX 333	Programming Principles	3	0	0	3	CSE
34	GEDX 334	Public Speaking and Rhetoric	2	1	0	3	English
35	GEDX 335	R Programming	2	0	2	3	CA
36	GEDX 336	Smart Sensors for Healthcare applications	3	0	0	3	EIE
37	GEDX 337	Total Quality Management	3	0	0	3	Mech.
38	GEDX 338	Vehicle Maintenance	3	0	0	3	Automobile
39	GEDX 339	Waste Water Management	3	0	0	3	Civil
40	GEDX 340	Web Application Development	3	0	0	3	CA

SEMESTER I

END 1183	GENERAL ENGLISH I	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: To enable students to read, comprehend and appreciate the value of literature to life

COB2: To help them acquire language skills through Literature

COB3: To develop LSRW skills through practice in variety of contexts

COB4: To improve their vocabulary and correct English usage

MODULE I **9**

Poetry: No Man is an Island – John Donne;

O Captain! My Captain! –Walt Whitman

Speaking: Introducing oneself and Introducing each other

Writing: Hints Development

Language: Articles, Adjectives & Adverbs (comparisons), Punctuation

Vocabulary: Homophones and homographs

MODULE II **9**

Prose: “Spoken English and Broken English” – G.B.Shaw

Listening: Listening for gist (general meaning)

The Speech that made Obama President. (6.12 minutes)

Speaking: Conversations - formal and semi formal contexts

Writing: Jumbled sentences

Language: Pronouns and Linking words, Conjunctions

Vocabulary: Register – Formal, semi-formal and Informal

9**MODULE III**

Short story: “The Cherry Tree” - Ruskin Bond

Speaking: Asking questions (about companies. Products, Jobs)

Creative Writing: Open ended stories

Language: Question Forms – ‘Wh’ & Yes/No

Vocabulary: Prefixes and Suffixes, negative prefixes

9**MODULE IV**

Short story: “The Last Leaf” - O. Henry

Speaking: Role play (Telephone call to a supplier, enquiry about products)

Writing: Letter of Enquiry, Replies to Enquiry

Language: Tenses

Vocabulary: Synonyms and Antonyms

MODULE V

9

Prose: “Voluntary Poverty” – Mahatma Gandhi

Listening: Listening for specific information - You must follow if you want success by SundarPichai. (8.42 minutes)

Speaking: Giving the summary of an article (from newspapers)

Writing: Order Letter, Complaint Letter

Language: Subject -Verb Agreement

Vocabulary: Business Vocabulary (marketing, air travel)

L - 45; Total Hours - 45

REFERENCES:

1. Guy Brook-Hart, Business Benchmark Upper- Intermediate Student's Book, CUP, 2006
2. Sriraman.T, Macmillan College Prose, Laksmi Publications, 2015
3. Whitby, Norman, Business Benchmark: Pre-intermediate to Intermediate, 2nd Edition, CUP, 2014.
4. Swan.M, Practical English Usage, OUP, 2005.
5. <https://www.thehindu.com/opinion/open-page/it-has-done-more-harm-than-good/article5129459.ece>
6. <https://www.youtube.com/watch?v=OFFwDe22CoY>
7. https://www.youtube.com/watch?v=iAIsq_orac8

COURSE OUTCOMES:

CO1: Respond to literary texts efficiently

CO2: Appreciate and critically analyze literary texts

CO3: Display effective LSRW skills in academic and professional contexts

CO4: Demonstrate a range of appropriate vocabulary in a variety of situations

CO5: Communicate effectively using grammatically correct language

Board of Studies (BoS) :

13thBoS of the Department of English held on 17.6.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	H	H	H	H	M	H	H	L	L	M
CO2	H	H	H	H	H	M	H		L	M
CO3	M	H	H	L	M	H	H	M		L
CO4	H	H	H	H	H	H	H	H	L	
CO5	L	H	L	H	H	M	H			

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: The acquisition of LSRW skills of English language could help students in promoting lifelong learning opportunities.

LND 1181	பொதுத் தமிழ் - I	L	T	P	C	
SDG 16	GENERAL TAMIL - I	2	1	0	3	
நோக்கங்கள்						
<ul style="list-style-type: none"> சமூக மாற்றச்சிந்தனைகளை உள்ளடக்கிய தற்கால இலக்கியங்களை அறிமுகம் செய்தல் இருபதாம் நூற்றாண்டு மரபுக்கவிதைகளை அறிமுகம் செய்தல் புதுக்கவிதை, சிறுகதை, உரைநடை ஆகிய இலக்கியங்களை நயம் பாராட்டுதல் புதுக்கவிதை மற்றும் சிறுகதையின் தோற்றம் வளர்ச்சி குறித்து எடுத்துரைத்தல் சந்திப்பிழையின்றி எழுத மாணவர்களைப் பயிற்றுவித்தல் கவிதை மற்றும் சிறுகதை எழுதமாணவர்களை ஊக்கப்படுத்துதல் 						
அலகு I	இருபதாம் நூற்றாண்டு மரபுக்கவிதைகள்					8
கவிமணி தேசிய விநாயகம் பிள்ளை - உடல் நலம் பேணல், பாரதியார்- செந்தமிழ் நாடு, பாரதிதாசன்- நீங்களே சொல்லுங்கள், கண்ணதாசன்- குடும்பம் ஒரு கதம்பம்.						
அலகு II	புதுக்கவிதைகள்					8
இன்குலாப்- போராட்டம், அப்துல்காசிம்- மண், வைரமுத்து-விதைச் சோளம், நா.காமராசன்-அவிகள், ஆண்டாள் பிரியதர்சினி- தொலைந்து போனது, மு.மேத்தா-தேசப்பிதாவுக்கு ஒரு தெருப்பாடகனின் அஞ்சலி, ஹைக்கா கவிதைகள்.						
அலகு III	சிறுகதைகள்					8
ஜெயகாந்தன்-நந்தவனத்தில் ஓர் ஆண்டி, கி.இராஜநாராயணன்- கதவு, சு.சமுத்திரம்- ஏழை-ஆப்பிள்-நட்சத்திரம், மாதவிக்ருட்டி-நெய்ப்பாயாசம், தி.ஜானகிராமன்-முள்ளுடி.						
அலகு IV	மொழிப்பயிற்சி					7
கலைச்சொல்லாக்கம், பிழைத்திருத்தம் (ஒருமை, ல-எ-ஓகர, ர-ற-கர, ண-ந-னகரவேறுபாடுகள்), அயற்சொற்களைதல்.						
அலகு V	இலக்கிய வரலாறு					7
பாடந்தழவியது (இருபதாம் நூற்றாண்டு மரபுக் கவிதைகள், புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும், சிறுகதையின் தோற்றமும் வளர்ச்சியும்)						
அலகு VI	படைப்பிலக்கியம்					7
கவிதை எழுதுதல், சிறுகதை வரைதல்						
L – 30 ; T – 15 ; TOTAL HOURS – 45						
அறிப்புகள்						
<ol style="list-style-type: none"> பொதுத் தமிழ்-செய்யுள் திரட்டு-தமிழ்த் துறை வெளியீடு தமிழ் இலக்கிய வரலாறு-சோம. இளவரசு சிறுகதைத் தொகுப்பு (கட்டுரைக் களஞ்சியம்) 						
வெளிப்பாடு						
<ul style="list-style-type: none"> மாணவர்கள் சமூக மாற்றச்சிந்தனைகளை அறிந்து கொள்வர் இருபதாம் நூற்றாண்டு மரபுக்கவிதைகள் குறித்த அறிவினைப்பெறுவர். சந்திப்பிழைகளை நீக்கி எழுதும் திறன் பெறுவர் இருபதாம் நூற்றாண்டு தமிழ் இலக்கியத்தின் வரலாறு, வளர்ச்சி, பாடுபொருள் ஆகியவற்றை உணர்ந்து கொள்வர். இருபதாம் நூற்றாண்டு தமிழ் இலக்கியப் படைப்பாளர்களைப் பற்றி அறிந்து கொள்வர். புதிதிலக்கியங்களைப் படைக்கும் திறனையும் திறனாய்வு செய்யும் திறனையும் பெறுவர் 						

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1							M	M	M	M		M				
CO2							L	L	L	M		M				
CO3							L	M	L	L		L				
CO4							L	L	M	L		L				
CO5							L	L	L	L		L				
CO6							M	M	M	M		L				

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 16: Peace, Justice and Strong Institutions

Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime through the Quranic, Vedic and Biblical literature.

MODULE V TAG FÜR TAG 7

To learn time related expressions and asking Time, speak about family, ask excuse; Vocabulary: related to the topic; Simple Conversation skills (pertaining chiefly to simple dialogues in everyday situations), Grammar: Preposition – am, im, um, von bis, Modal verbs, Present perfect Tense with regular and irregular verbs.

MODULE VI ZEIT MIT FREUNDEN 8

To speak about birthdays, understand and write an invitation, converse in the restaurant and Pay; Vocabulary: related to the topic; Simple Text -Translation and Reading Comprehension Practice German Into English Vice versa: Grammar: Accusative personal pronouns, Possessive Pronomen, Verbs and prepositions, Gern - word Usage in Sentence formation.

L – 30; T – 15; Total Hours – 45

TEXT BOOKS:

1. Stefanie Dengler, “Netzwerk A1.1”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2015.

PRACTICE BOOK:

1. Johannes Gerbes, “Fit fürs Goethe-Zertifikat A1”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2010.

REFERENCES:

1. Paul Rusch, “Einfach Grammatik”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2012.
2. Hermann Funk, “studio d A1”, Goyal Publishers & Distributors Pvt. Ltd., Delhi, 2009.15OH78 German Language.

COURSE OUTCOMES:

On successful completion of this course learners will be able to

CO1: show their proficiency in German Language.

CO2: use appropriate vocabulary in real life contexts.

CO3: use appropriate grammatical forms while communicating with people.

CO4: effectively use the language in social and academic contexts.

CO5: comprehend matters which are of daily usage

CO6: communicate as per people's need and requirement.

Board of Studies (BoS):

14th BoS of the Department of Commerce
held on 22.04.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H	H	M	H		H	H	H	M	H	M	H		
CO2				H		H	H	H	H	H		H		
CO3				H		H	H	H	H	H		H		
CO4				H		H	H	H		H		H		
CO5				H		H	H	H		H		H		
CO6				H		H	H	H		H		H		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4 : Quality Education

The substantially improve the relevant skills which develop the confidence in young people, including technical and vocational skills, help for employment, decent work and entrepreneurship.

LND 1183	ARABIC LANGUAGE	L	T	P	C
SDG 4		3	0	0	3

COURSE OBJECTIVES:

The course aims to teach

COB1: Arabic alphabets, reading and writing and pronunciation.

COB2: Listening and writing of words related to market, doctor, parts of body, dining.

COB3: Arabic simple sentences using names of animals, birds, singular and plural.

COB4: Listening and writing of Countries' names, singular, dual and plural.

COB5: Arabic sentences using verbs, tenses and numbers.

MODULE I INTRODUCTION TO ARABIC READING AND WRITING 9

Introduction to Arabic alphabets - reading from right to left - Listening to audio & video – practice correct pronunciation – Writing join letters from right to left - (lessons: 1 and 2): (حجرة الدراسة ، حجرة الدراسة 2، المرور) - introduction to Arabic words in and around the classroom – Transport - Vocabulary related to market - introduction of verbs (lessons: 4 – 6).

MODULE II LISTENING ARABIC COMMUNICATION 9

Reading skill: Lessons 4 – 6. Words related to doctor, parts of body, dining, fruits, food items, family members, house and air travel (أسماء أعضاء الجسم والمطعم والفواكه) (وغيرها) Vocabulary related to names of animals, birds (lessons: 7 – 12).

MODULE III SIMPLE SENTENCES 9

Home – singular and plural - introduction to gender: first person, second person and third person – interrogatory sentences - arabic simple sentences – nominal sentence and verbal sentence (الجملة الاسمية والفعلية) (lessons: 13 & 14) Words related to kitchen utensils – cooking (أسماء أواني المطبخ والطبخ) – introduction to gender: first person, second person and third person (التذكير والتأنيث) – singular and plural – vocabulary related to office – possession (الإضافة) - (lessons: 15 – 17)

MODULE IV COMMUNICATION PRACTICE 9

Countries names – world map - performing ablution – vocabulary related to prayer - singular, dual and plural - situational communication - emphasis on interrogation (المحادثة العربية) (lessons: 18 – 20)

MODULE V TENS, SINGULAR & PLURAL 9

Sentence making – words related to prayer – verbs and tenses – communication on dining – gender - singular and dual – numbers – discussion of evening – dining manners (المفرد والتثنية والجمع والعدد) (lessons: 21 – 25)

L – 30; Total Hours – 30

TEXT BOOKS:

1. Al QirathulArabiyya Lil Mubtadiyeen القراءة العربية للمبتدئين (UmmulQura University, Makkah), Bukhari Aalim Arabic College, 2005.

REFERENCES:

1. Al Arabiya Lin Nashiyeen (Education Ministry, K.S.A.), Bukhari Aalim Arabic College, 2005.
2. Dr. V. Abdur Raheem, Durus Al LugathilArabiyya Li GhairinNatiqeenBiha, Islamic Foundation Trust, Chennai, 2002.

COURSE OUTCOMES:

At the end of the course, the student is expected to:

CO1:vocabularyrelated to the market, doctor, parts of body, dining.

CO2:identifyArabic names of animals, birds, singular and plural, interrogatory sentences.

CO3:recognizeArabic alphabets, reading and writing and pronunciation.

CO4:usecountries names, singular, dual and plural.

CO5: form Arabic sentences using verbs, tenses and numbers.

3	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1						L									
CO2							M								
CO3							M								
CO4						L									
CO5							M								

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Developing Language skill

Statement: Arabic language enhances effective communication in the workplace.

MAD1187	ALGEBRA AND NUMERICAL	L	T	P	C
SDG: 4	METHODS	3	1	0	4

COURSE OBJECTIVES:

COB1: To develop the basic concepts of Numerical methods that are useful for application oriented topics

COB2: To introduce the concept of Eigen values and eigenvectors of matrix algebra

COB3: To lay the foundation for finding the roots of equations

COB4: To familiarize the students with the functions of several variables

COB5: To evaluate various types of integrals

MODULE I NUMERICAL SOLUTION OF 9+3
EQUATIONS AND INTERPOLATION

Newton Raphson method – Operators E, Δ, ∇ and their relations – Difference Tables – Newton's forward and backward interpolation formula for equal intervals- Lagrange's interpolation formula.

MODULE II MATRICES 9+3

Symmetric – Skew-Symmetric - Orthogonal and Unitary matrices - Rank of a Matrix - Consistency - Characteristic equation - Eigenvalues and Eigenvectors - properties - Cayley Hamilton's Theorem (proof not needed) - Simple applications.

MODULE III THEORY OF EQUATIONS 9+3

Polynomial Equations with real Coefficients - Irrational roots - Complex roots - Symmetric functions of roots - Transformation of equation by increasing or decreasing roots by a constant – Reciprocal equations.

MODULE IV DIFFERENTIAL CALCULUS 9+3

Rules of differentiation - Derivative of implicit function - Successive differentiation nth derivatives - Leibnitz theorem (without proof) and applications - maxima and minima of functions of two variables - Partial differentiation - Euler's Theorem.

MODULE V INTEGRAL CALCULUS 9+3

Integration of rational functions - algebraic expressions involving only one irrational quantity- rational functions of $\sin x$ and $\cos x$ - Trigonometric substitutions - Bernoulli's formula for integration by parts - reduction

formulae - properties of definite integral - Evaluation of double and triple integrals.

L –45 ; T-15; Total Hours – 60

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics” (43rd edition), Khanna Publishers, New Delhi, 2012
2. Grewal, B.S., “Numerical methods in Engineering and Science”, 7th edition, Khanna Publishers, New Delhi 2007.

REFERENCES:

1. Stewart J, “Single Variable Calculus”, (4th edition) Brooks / Cole, Cengage Learning 2010.
2. Tom M. Apostol - Calculus, Vol. I (second edition) John Wiley and Sons, New Jersey 2007.
3. MacDuffee, C.C. - Theory of Equations, John Wiley & Sons., New Jersey 1954.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: find the roots of the equation numerically

CO2: solve Eigen value and eigenvector problems

CO3: classify and solve polynomial equations of different types

CO4: evaluate the maxima and minima of functions of two variables

CO5: integrate different types of double, triple and definite integrals

Board of Studies (BoS) :

12th BOS of Mathematics and AS
held on 23.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M														
CO2	M														
CO3	H														
CO4	M														
CO5	M														

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong opportunities for all

Learning of various mathematical tools will lead to knowledge of applications in Computer Science

CAD 1101	COMPUTER FUNDAMENTALS AND	L	T	P	C
SDG: 9	ORGANIZATION	3	0	0	3

COURSE OBJECTIVES:

COB 1: Impart the knowledge on historical development of Computers, different number systems and logic gates.

COB 2: Learn the basic structure of CPU, computer memory and Input - Output units.

COB 3: Understand the concepts of Boolean algebra and Circuit reduction methods.

COB 4: Describe the components of Sequential logic circuits.

COB 5: Explain the working principles of Arithmetic and logic unit ALU.

MODULE I INTRODUCTION 9

General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications - Number systems - Conversion from one number system to another - compliments - Binary codes - Binary logic - Logic gates - Truth tables.

MODULE II COMPUTER ORGANIZATION 9

Computer organization, Block Diagram of Computer- Central processing unit, computer memory – primary memory and secondary memory, Secondary storage devices – Magnetic and optical media, Associative memory; Cache memory organization and Virtual memory organization Input and output units, OMR, OCR, MICR, scanner, mouse, modem.

MODULE III BOOLEAN ALGEBRA AND CIRCUIT REDUCTION METHODS 9

Boolean Algebra, Axioms - Truth table simplification of Boolean function- logic diagrams - Dem organs theorems, duality theorem - K-map method – Mc-Clausky tabulation method - Universal Logic gates.

MODULE IV SEQUENTIAL LOGIC CIRCUITS 9

Sequential logic – RS, JK, D and T Flip flops - Registers –Shift Registers - Counters – Ripple Counters – Synchronous Counter – Design of Counters.

MODULE V COMBINATIONAL LOGIC CIRCUITS 9

Adders – Subtractors – Decoders – Encoders – Multiplexer -Demultiplexer – Design of Circuits using decoders/Multiplexers – ALU.

L – 45; Total Hours –45**TEXT BOOKS:**

1. Rajaraman V. And Neeharika Adabala “Fundamentals of Computers” 6th Edition, PHI New Delhi 2017.
2. M.M. Mano, Digital Logic and Computer Design, Pearson Education, 2016.

REFERENCES:

1. Charles H. Roth, Jr., Kinney, “Fundamentals of Logic Design”, Brooks Publications, Seventh Edition, 2013
2. E Balagurusamy “Fundamental of Computing and programming” 2nd edition, Tata McGraw-Hill, 2012
3. P.K. Sinha “Computer Fundamentals” BPB Publications; Reprint Edition 2018
4. Hamacher “Computer Organization” McGraw Hill Education, 2011.

COURSE OUTCOMES:

CO1: Identify different types of computers with hardware configuration for different utility purposes.

CO2: Distinguish between primary memory and secondary storage devices and their properties.

CO3: Apply the principles of logic circuits and Boolean algebra which forms the basis of digital computer design.

CO4: Design knowledge of components with Sequential logic circuits with counter.

CO5: Design knowledge of Arithmetic Knowledge Unit –ALU in a computer system.

Board of Studies (BoS) :

15thBoS was held on 22.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	H		H											H
CO2					M			M	M					H
CO3	H		M										H	M
CO4			H	M	M									H
CO5			H	M	M									H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

The course outcomes are measurable and enable the learner to apply concepts of theoretical principles of computer organization learned in the course to design a customized computer system. The learner would be able to design a advanced computer laboratory with innovative capacity to solve all kinds of hardware infrastructure and installation related issues and provide hardware infrastructure support services.

CAD 1102	PROGRAMMING IN C	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the fundamental concepts of Programming

COB2: Understand the basics of C language

COB3: Learn about advanced concepts of C language

COB4: Understand how pointer works in C language

COB5: Gain knowledge about File handling in C

MODULE I OVERVIEW OF PROGRAMMING 9

Introduction to computer based problem solving, Program design and implementation issues- Flowcharts & Algorithms, Top down design & stepwise refinement, Programming environment – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters.

MODULE II FUNDAMENTALS OF C PROGRAMMING 9

Overview of C, Identifier and Keywords, Data Types, Constants & Variables, Expressions, Statements, Operators, Decision Making Statements, Switch, Break and Continue, Go to Statement, Looping Statements, Introduction to Arrays: Declaration, Initialization - One dimensional array, Two dimensional arrays.

MODULE III ADVANCED PROGRAMMING TECHNIQUES 9

Introduction to functions: Function prototype, Function definition, Function call, Recursions, Scope rules- Local & global variables, Storage Classes - Automatic, External, Static, Register Variables, Type modifiers and storage class specifiers for data types, Type casting, Type conversion.

MODULE IV DYNAMIC DATA STRUCTURES IN C 9

Pointers, Pointer operators, Pointer Arithmetic, Arrays and pointers, Pointers to pointers, pointers to functions, Structures- Basics, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, Unions –Declaration, uses, Enumerated data-types, typedef

MODULE V ADDITIONAL FEATURES 9

File Handling –The file pointer, file accessing functions, C Preprocessor- #define, #include, #undef, Conditional compilation, directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions.

L- 45; Total Hours –45**TEXT BOOKS:**

1. Let Us C By Yashwant Kanetkar, 15th Edition, PBP Publications, 2010.

REFERENCES:

1. Programming in ANSI C by Balaguruswamy, 8th Edition, Tata McGraw Hill, 2019.
2. C: The Complete Reference By Herbert Schildt, 4th Edition, 2017

COURSE OUTCOMES:**CO1:** Identify the characteristics of programming**CO2:** Describe the fundamentals of C programming**CO3:** Apply the advanced concepts of C programming**CO4:** Identify the role of Pointers in C language**CO5 :** Explain the importance of file handling**Board of Studies (BoS) :**15thBoS was held on 22.06.2021**Academic Council:**17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1			H										M	
CO2	M													L
CO3			M					L	M					M
CO4			M					L	M					M
CO5			M						M					M

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The skills taught in this course for the learners with respect to the course outcomes are measurable and useful in improving the programming skill of the learner. As the future software engineer, the learner of this subject will get a strong foundation and it will help him in building quality software.

CAD 1103	DATA STRUCTURES	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Impart the fundamental concept of Data Structures and algorithms

COB2: Implement and apply the concepts of stacks and Queues.

COB3: Understand the operations and types of the Linked list.

COB4: Get familiarized with searching and sorting algorithms.

COB5: Implement the traversal operations of tree and graph.

MODULE I INTRODUCTION TO DATA STRUCTURES 9

Definition - Classification of data structures - primitive and non-primitive - Elementary data organization – Arrays - Pointers - Accessing the address of a variable - Declaring and initializing pointers - Accessing a variable through its pointer. Memory allocations - static and dynamic memory allocation - Memory allocation functions - Recursion–Definition - Advantages, Implementation - Binomial coefficient, Fibonacci, GCD.

MODULE II STACK AND QUEUE 9

Stack – Operations - Evaluating arithmetic expressions - Conversion of Infix to postfix expression, Infix to prefix expression – Applications of Stack - Queue – Operations - Circular Queue - Priority Queue - deque - Applications of queues.

MODULE III LINKED LIST 9

Abstract Data Types (ADTs) - List ADT – Array-based implementation - linked list implementation – singly-linked lists- circularly linked lists- doubly-linked lists - Insertion, Deletion, search and display operations.

MODULE IV SEARCHING AND SORTING TECHNIQUES 9

Searching Techniques: Linear Search - Binary Search - Sorting Techniques: Bubble Sort - Insertion Sort - Selection Sort - Quick Sort - Radix Sort - Heap Sort- Merge Sort.

MODULE V TREES AND GRAPHS 9

Trees: Basic terminologies - Binary tree – Representations - Binary tree traversal – Inorder, Preorder and Postorder traversals - Graphs: Terminologies - Graph traversal - Depth First Search, Breadth-First Search - Minimum Spanning trees – Prim’s and Kruskal’s Algorithm - Shortest path algorithm – Dijkstra's algorithm.

L – 45 ; Total Hours – 45**TEXT BOOKS:**

1. Lipschutz: Schaum's outline, "Data structures with C "Tata McGraw-Hill, 2017.
2. ReemaThareja, "Data Structures using C", Second Edition, Oxford University Press, 2011.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2014.

REFERENCES:

1. A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, "Data Structures Using C" Pearson Education India, 2ndEdition, 2015.
2. Ellis Horowitz, SartajSahni, "Fundamentals of Data Structures in C", University Press, 2020.
3. Robert Kruse, C.L. Tondo, Bruce Leung, Shashi Mogalla, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2007.
4. Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Application", Tata McGraw-Hill, 2017.

COURSE OUTCOMES:**CO1:** Demonstrate the importance of Data Structures in implementing algorithms**CO2:** Understand and implement the applications of linear data structures**CO3:** Suggest appropriate linear data structures to the real-time problems**CO4:** Apply the sorting and searching technique for any application.**CO5:** Understand and implement the applications of trees and graphs**Board of Studies (BoS) :**15thBoS was held on 22.06.2021**Academic Council:**17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H												M	
CO2	H			H					L		M		H	
CO3		H			M								H	M
CO4	H	H											H	
CO5		H		H	M				L		M		H	M

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Learners able to create, design, develop, upgrades and continuously improves their innovation in Data structure algorithms. Learners have capacity – building to invest in innovation and in the development of clean and sound technologies in support of the sustainable development goals.

CAD1104	PROGRAMMING IN C LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

COB1: Provide programming skill in C language.

COB2: Prepare the learners with appropriate software to understand the control structures and functions.

COB3: Train the learners to understand the basic algorithms and techniques in C environment.

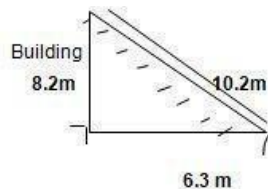
COB4: Disseminate the techniques and methods to handle the dynamics memory using pointers.

COB5: Understand the concept to implement applications developed using C language.

PRACTICALS

List of Experiments:

1. Write a C program to generate all prime numbers up to nth number.
2. Write a C program to find Odd & Even numbers in n series.
3. Write a C program to calculate simple and compound interest.
4. Write a C program to perform the arithmetic expression using switch statement.
5. Write a C program to concatenate two strings without using library functions.
6. A cow is tied to a pole centered in field using 45 m rope. Write a C program to compute the total area that the cow is capable of grazing.
7. A ladder is laid onto a building such that the distance between the ladder and building is 6.3 m. The length of ladder is 10.2 m as shown below. Write a C program to calculate the area of triangle so formed.



8. Rahul's birthday falls on 28th February 1994. Write a C program to check if given year is a leap year or not.
9. A patient is suffering from high fever with 104.2 F. Write a C program to find his body temperature in Celsius.
10. Write a C program using string function to display the newly changed password based on the following constraints. A user has password 4221899 as his login credential for a banking website. His password is about to expire.

He has to change his password and has decided that the new password would be the reverse of the existing one.

11. Write a C program to print Fibonacci series of numbers.
12. Rainfall received in few areas in Chennai were recorded as 31cm, 11.64cm, 16.87cm, 28 cm and 23.5 cm. Write a C program to calculate total amount of rainfall and average rainfall received that day.
13. Consider an array in following order: 58, 51, 35, 78, 15, 22 and 85. Write a C program to search the value of a given number using linear search.
14. The heights of ten students were marked as 163cm, 171 cm, 158 cm, 167cm, 175cm, 160cm, 173 cm, 149 cm, 180cm and 154cm. Write a C program to sort the given heights in ascending or descending order.
15. Write a C program to find the CGPA of the student according to following constraints.

MARKS	GRADE
90-100	S
80-89	A
70-79	B
60-69	C
50-59	D
40-49	E
0-39	U

16. The quantity of stationary sold for three days are shown. Write a C program to find the product of the quantity of items mentioned below in the form of matrix.

Day/Item	Pen	Pencil	Eraser
Day1	10	5	5
Day 2	8	4	2
Day3	5	10	10
Day/Item	Notebook	Whitener	Marker
Day1	3	6	5
Day 2	2	1	3
Day3	5	4	15

17. Write a C program to calculate factorial of a number using recursion.
18. Write a C program to store and display the student mark details for 3 students including name, department, subjects and respective marks using Structure.
19. Write a C program to print the elements of array using pointers.
20. Write a C program to input details (name, department, salary) for 3 employees into a file created and read the contents from the file to display all the details along with average salary of those employees on output terminal using suitable file handling functions. Create a scenario based on real time domain.

P-60; Total Hours – 60

TEXT BOOKS:

1. ReemaThareja, Computer Fundamentals and Programming in C,OxfordPress,2012.

REFERENCES:

1. Programming in C, PradipDey, Manas Ghosh, 2nd edition Oxford University Press, 2013.
2. Programming in ANSIC, E.Balaguruswamy, 5thEdition, McGraw- Hill,2010.

COURSE OUTCOMES:

CO1: Apply the basic logics and mathematical concepts behind programming language.

CO2: Apply and use various computing logics to solve a problem using C programming.

CO3: Enhance their programming skills in C environment.

CO4: Apply structure, array, and pointer concepts in C platform to provide a solution for real time scenario.

CO5: Develop and implement C programming application to solve the real time problem.

Board of Studies (BoS) :

15th BoS was held on 22.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	M								H				H	
CO2			H				H							H
CO3								M	H	M				H
CO4			H	M					H				H	
CO5							H	L	H	M		H		H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Programming logics, design and developments taught in this course for the learners with respect to the course outcomes are measurable and useful in improving the programming skill of the learner. As the future of the software industry enhances rapidly, the learners will be able to understand and implement any technologies by having a strong foundation in C programming language.

CAD 1105	DATA STRUCTURES LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

COB1: Understand the implementation of recursive function.

COB2: Implement stack and queue using arrays and dynamic memory allocation.

COB3: Introduce the implementation of a linked list and the various operations.

COB4: Learn to implement various searching and sorting algorithms.

COB5: Introduce the Tree and Graph implementation using C.

PRACTICALS

List of Experiments:

1. Write a C program to find the GCD of two numbers using recursive function.
2. Write a C Program to read the list of elements and print the array elements using pointers.
3. Implementation of the following operations in stack using arrays.
 - a. Push
 - b. Pop
 - c. Display
4. Implementation of stack using linked list.
5. Implementation of queue using arrays.
6. Implementation of queue using linked list.
7. Implementation of Singly Linked List. The operations to be supported are:
 - a. Insertion operation
 - i. At the front of the list
 - ii. At the back of the list
 - iii. At any position in the list
 - b. Deletion of the first and last node
 - c. Searching a node. If the specified node is not present in the list then 'the node is not present in the list' should be displayed.
 - d. Display all the nodes in the list.
8. Implementation of Doubly Linked List. The operations to be supported are:
 - a. Insertion operation
 - (i) At the front of the list
 - (ii) At the back of the list
 - (iii) At any position in the list
 - b. Deletion of the first and last node
 - c. Displaying all the nodes in the list.

9. Write a C program to implement the linear search and binary search. Find an element that is present or not in a given list of numbers. If the number is present then display the position of the number in a list of values.
10. Write a program to implement the Insertion Sort.
11. Write a program to implement the Selection Sort.
12. Create a binary search tree and traversing it using Inorder, Preorder and Postorder.
13. Write a C program to implement Dijkstra's algorithm to find the shortest path between two nodes in a graph.

P – 60; Total Hours - 60

TEXT BOOKS:

1. Magnifying Data Structures, Aprita Gopal, First Edition, Prentice Hall India Learning Private Limited (2010).
2. Data Structures in C, Horowitz, Sahni, Anderson-Freed, Universities Press, Second edition (2008).
3. NarasimhaKarumanchi, "Data Structures and Algorithms Made Easy: Career Monk Publications; Fifth edition, 2016.
4. Structure and Algorithmic Puzzles", 2nd Edition, Create Space Independent Publishing Platform, 2011.

REFERENCES:

1. Ashok N. Kamthane, "Introduction to Data Structures in C", 2nd Edition, WileyPublications, 2008.
2. Data Structures Using C - A.S.Tanenbaum, Y. Langsam, and M.J.Augenstein, Pearson Education India; 2nd edition, 2015.

COURSE OUTCOMES:

CO1:Write and demonstrate recursive methods

CO2:Implement stack and queue and evaluate various operations involved in it

CO3:Develop an application using singly linked list and doubly linkedList

CO4:Implement and analyze various searching techniques and sortingTechniques

CO5:Implement the various operations in the Tree and Graph

Board of Studies (BoS) :

15thBoS was held on 22.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	L	H										H		
CO2		M	H												
CO3			M		M		M								
CO4								M							
CO5		H	H												

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG No. 9

Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement:

Learners able to create, design, develop, upgrades and continuously improves their innovation in Data structure and algorithms. Learners have capacity of design and development of solution methodologies and computational algorithms for practical implementation in support of the sustainable development goals.

SEMESTER II

END 1283	GENERAL ENGLISH II	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1 :To enable students to read, comprehend and appreciate the value of literature to life

COB2 :To help them acquire language skills through Literature

COB3 :To develop LSRW skills through practice in variety of contexts

COB4 :To improve their vocabulary and correct English usage

MODULE I **9**

Poetry : The Second Coming – W. B. Yeats

Speaking :Expressing one’s opinion/Asking for others’ opinion, agree, disagree

Writing : Movie/Book Review, Slogan Writing

Language :Modals, Prepositions

Vocabulary: Business Vocabulary (advertisements, sales)

MODULE II **9**

Poetry : “Where the Mind is Without Fear”(Gitanjali 35) - Rabindranath Tagore

Listening : For understanding speaker’s opinion .How books can open your mind by Lisa Bu. (6.16 minutes)

Reading : To understand the meaning and purpose of short texts (mails, memos)

Writing : Email Writing , Memo writing

Language :If Clause

Vocabulary: Finance vocabulary

MODULE III **9**

Prose : “The Civilization of To-day” – C.E.M.Joad

Reading Comprehension: Digital habits across generations (learnenglish)

Speaking: Discussions

Writing : Fax

Language : Relative Clause

Vocabulary : Collocations – verb-noun collocations

MODULE IV **9**

Short story : “The Sparrows” - K. A. Abbas

Speaking : Making small talk
Writing : Job Application Letter
Language : Voice
Vocabulary:Employment vocabulary

MODULE V**9**

Short story : “First Confession”– Frank O’ Connor
Listening :Listening and taking short notes - Inspirational lesson for lifetime- How to manage failure and success by Dr. APJ (8.21 minutes)
Writing :Report Writing – Survey Reports
Language : Reported Speech
Vocabulary : Collocation sets about time and money

L- 45; Total Hours - 45**REFERENCES:**

1. Guy Brook-Hart, Business Benchmark Upper- Intermediate Student’s Book, CUP, 2006.
2. S.Mythili, V.Kadambari. Ed. Plumes of Many Colours: A Collection of Short stories, Blackie Books, 1994.
3. Sriraman.T. Macmillan College Prose, Laksmi Publications, 2015.
4. Swan.M. Practical English Usage, OUP, 2005.
5. Whitby, Norman. Business Benchmark: Pre-intermediate to Intermediate, 2ndEdition, CUP, 2014.
6. <https://learnenglish.britishcouncil.org/skills/reading/intermediate-b1/the-martian-a-book-review>
7. <https://learnenglish.britishcouncil.org/skills/reading/intermediate-b1/digital-habits-across-generations>
8. <https://www.youtube.com/watch?v=6ibCtsHgz3Y>
9. <https://www.youtube.com/watch?v=7E-cwdnsiow>

COURSE OUTCOMES:

CO1 :Respond to literary texts efficiently
CO2 :Appreciate and critically analyze literary texts
CO3 :Display effective LSRW skills in academic and professional contexts
CO4 :Demonstrate a range of appropriate vocabulary in a variety of situations

CO5 :Communicate effectively using grammatically correct language

Board of Studies (BoS) :

13th BoS held in the Department of
English On 17.6.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	H	H	H	H	M	H	H	L	L	M
CO2	H	H	H	H	H	M	H		L	M
CO3	M	H	H	L	M	H	H	M		L
CO4	H	H	H	H	H	H	H	H	L	
CO5	L	H	L	H	H	M	H			

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: The acquisition of LSRW skills of English language could help students in promoting lifelong learning opportunities.

LND 1281	பொதுத் தமிழ் - II			L	T	P	C
SDG 16	GENERAL TAMIL - II			2	1	0	3
நோக்கங்கள்							
<ul style="list-style-type: none"> சங்க இலக்கியங்களையும் சங்கப் புலவர்களையும் அறிமுகம் செய்தல். பழந்தமிழர்களின் அகப் புற வாழ்வினையும் பண்பாட்டினையும் எடுத்துரைத்தல். அற இலக்கியங்கள், பக்தி இலக்கியங்கள், காப்பியங்களை அறிமுகம் செய்தல் பல்வேறு சமயக் கோட்பாடுகளையும் உண்மைகளையும் உணர்த்துதல் கட்டுரைகளை எழுத மாணவர்களைப் பயிற்றுவித்தல் சந்திப் பிழையின்றி எழுத மாணவர்களைப் பயிற்றுவித்தல் 							
அலகு I	சங்க / அற இலக்கியங்கள்						8
புறநானூறு - 143 - ஆவது பாடல், நற்றிணை - 19 - ஆவது பாடல், திருக்குறள் - நட்பு, காலமறிதல், நாலடியார் - அவையறிதல், பழமொழி நானூறு - இன்ன செய்யாமை (5 பாடல்கள்), இனியவை நாற்பது - முதலைந்து பாடல்கள்							
அலகு II	பக்தி இலக்கியங்கள்						8
திருவாசகம் - எட்டாம் திருமுறை (5 பாடல்கள்), நம்மாழ்வார் - (5 பாடல்கள்), திருமந்திரம் (தேர்ந்தெடுக்கப் பெற்ற 5 பாடல்கள்).							
அலகு III	காப்பியங்கள்						8
சிலப்பதிகாரம் - வழக்குரை காதை 50-73 (23 அடிகள் மட்டும்), கம்பராமாயணம் - பாலகாண்டம் - நாட்டுப்படலம் (10 பாடல்கள்), இரட்சன்ய யாத்ரிகம் - சிலுவைப்பாடு (10 பாடல்கள்), சீராப்பராணம் - மாணுக்குப் பிணை நின்ற படலம் (தேர்ந்தெடுக்கப் பெற்ற 5 பாடல்கள்)							
அலகு IV	கட்டுரைகள்						7
உ.வே.சாமிநாதையர் - தமிழ்நாட்டு வணிகம், மா.இராசமாணிக்கனார் -சித்தன்வாசல், ம.லெ.தங்கப்ப - எது வாழ்க்கை, பி.எஸ்.அப்துர் ரஹ்மானின் வாழ்க்கை வரலாறு.							
அலகு V	இலக்கிய வரலாறு						7
எட்டுத் தொகை, பத்துப்பாட்டு							
அலகு VI	மொழிப்பயிற்சி						7
இலக்கணக் குறிப்புத் தருதல், வல்லினம் மிகுவிடங்களும் மிகாவிடங்களும், மொழிபெயர்ப்பு (ஆங்கிலத்திலிருந்து தமிழில் பெயர்த்தல்)கடிதங்களும் வகைகளும்							
				L – 30; T – 15; TOTAL HOURS – 45			

குறிப்புகள்							
<ol style="list-style-type: none"> பொதுத்தமிழ் - செய்யுள்திரட்டு - தமிழ்த்துறை வெளியீடு தமிழ் இலக்கிய வரலாறு - சோம.இளவரசு சிறுகதைத் தொகுப்பு (கட்டுரைக் களஞ்சியம்) 							
வெளிப்பாடு							
<ul style="list-style-type: none"> சங்க இலக்கியங்கள் குறித்தும் சங்ககால மக்களின் வாழ்வு குறித்தும் உணர்ந்து கொள்வர். சங்கப் புலவர்கள் பற்றிய தகவல்களையும் அவர்தம் படைப்பாளுமை பற்றியும் அறிந்து கொள்வர். தமிழர்களின் ஆன்மீகச் சிந்தனைகளைப் பற்றியும் அறச்சிந்தனைகள் பற்றியும் அறிந்து கொள்வர். மாணவர்கள் பல்வேறு சமயச் சிந்தனைகள் குறித்து தெரிந்து கொள்வர். தமிழ் இலக்கணங்கள் பற்றி அறிந்து கொள்ளவும் மொழிபெயர்ப்பு செய்யும் திறனும் பெறுவர். புத்திலக்கியங்களைப் படைக்கும் திறனையும் திறனாய்வு செய்யும் திறனையும் பெறுவர் 							

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1							M	M	M	M		M				
CO2							L	L	L	M		M				
CO3							L	M	L	L		L				
CO4							L	L	M	L		L				
CO5							L	L	L	L		L				
CO6							M	M	M	M		L				

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 16: Peace, Justice and Strong Institutions

Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime through the Quranic, Vedic and Biblical literature.

CO3: Introduce him / her and others as well as ask others about themselves and communicate using simple sentences.

CO4: Write simple sentences and short paragraphs in German.

CO5: Identify and deal with social and cultural aspects of Germany and other German speaking countries.

CO6: Listen and identify individual sounds of German and simple day-to-day conversations

CO7: Speak simple sentences using basic sounds and words

CO8: Read and understand short passages on familiar topics

CO9: Apply basic sentence structures while writing

Board of Studies (BoS):

Academic Council:

14th BoS of the Department
of Commerce held on
22.04.2021

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	M	H		H	H	H	M	H	M	H				
CO2				H		H	H	H	H	H		H				
CO3				H		H	H	H	H	H		H				
CO4				H		H	H	H		H		H				
CO5				H		H	H	H		H		H				
CO6				H		H	H	H		H		H				

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4 : Quality Education

The substantially improve the relevant skills which develop the confidence in young people, including technical and vocational skills, help for employment, decent work and entrepreneurship.

LND 1283	MODERN COMMUNICATIVE ARABIC	L	T	P	C
SDG 4		3	0	0	3

COURSE OBJECTIVES:**The course aims to teach:**

COB1: Communication in the situations of marketing clothes, food, etc.

COB2: Vocabulary about the climates, seasons and hold telephonic conversations

COB3: Vocabulary related to various games, students' associations.

COB4: Communication in Work place like ticketing, booking, confirmation & passport procedures

COB5: Vocabulary related to illness, numbers and communication with doctors.

MODULE I BUSINESS PLACE COMMUNICATION 9

Reading and listening Lesson 9: marketing (التسويق) –vocabulary related to marketing clothes, food, different types of contracts- conversation in business place - price, marketing, subject and predicate (المبتدأ والخبر), using interrogating form of (بكم - أي)

MODULE II USAGE OF TENSES 9

Situational conversation - Lesson 10: climate (الجرّ) – vocabulary related to climate, places& seasons, discussion question and answers – telephonic conversations – order (فعل الأمر) – interrogative form (كيف) - negative form of المضارع

Lesson 11: people and places (الناس والأماكن) – vocabulary related to people and places, colours, feminine gender – place of work – transportation – question and answer – past tense – usage of articles (مع - من - إلى - في - إلى - من - مع) (استخدام الحروف: في - إلى - من - مع)

MODULE III SENTENCES IN COMMUNICATION 9

Lesson12 : hobby (الهوايات) - vocabulary related to various games, students' associations – adjectives and synonyms – (الفعل المضارع المسند إلى ياء المخاطبة – الإشارة) –

MODULE IV CONVERSATION OF BUSINESS CONVERSATION 9

Lesson:13 travel (السفر) - vocabulary related to ticket booking – confirmation – passport procedures – resident permits (الحجز والتأكيد والجوازات والإقامة)– lost luggages – four directions – conversation about services – seeking information of luggage lost.

Lesson:14 haj and umrah (الحج والعمرة) - vocabulary related to haj and umrah – expression of arabic numbers – procedures of umrah and haj – (الاستفهام: متى - كيف -) (بم - أين)

MODULE V SITUATIONAL CONVERSATION**9**

Lesson 15: health (الصحة) - vocabulary related to illness – numbers 100 and 1000 – doctor's visit – communication with doctor – (الاستفهام: لماذا)

Lesson 16: vacation (العطلة) - vocabulary related to holidays – festivals – travel – spending holidays – Arabic months – interrogative form (أين، المضارع مع) (الاستفهام: كم – أين، المضارع مع) (واو الجماعة: ستقضون)

L – 45 ; Total Hours – 45**TEXT BOOKS:**

1. Al Lughathul Arabiya (اللغة العربية ، الصف الأول ، الجزء الأول), Part I, Bukhari Aalim Arabic College, 2004.

REFERENCES:

1. Dr. F. Abdur Raheem, Durus Al LugathilArabiyya, Islamic Foundation Trust, Chennai, 2002.
2. Al QirathulArabiyya Lil Muftadiyeen (UmmulQura University, Makkah), Bukhari Aalim Arabic College, 2005.

COURSE OUTCOMES:

At the end of the course, the student is expected to

CO1: communicate in the situation of marketing clothes, food, etc.

CO2: discuss about the climates, seasons and hold telephonic conversations

CO3: discuss in the playground, students' gatherings

CO4: communicate in certain work places

CO5: recognize proper usage of sentences in communication.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1						L									
CO2							M								
CO3							M								
CO4						L									
CO5							H								

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Developing Language skill

Statement: Arabic language enhances effective communication in the workplace.

MAD 1288	PROBABILITY AND STATISTICS	L	T	P	C
SDG: 4		3	1	0	4

COURSE OBJECTIVES:

COB1: To impart knowledge on the basic concepts of probability

COB2: To understand random variables and distributions

COB3: To provide an understanding of moment generating functions

COB4: To learn joint density function and use of generating functions

COB5: To understand correlation and the regression lines

MODULE I BASIC PROBABILITY CONCEPTS 9+3

Sample space - events - algebraic operations on events - definition of probability - Conditional probability - addition and multiplication theorems of probability - Baye's theorem-Applications.

MODULE II RANDOM VARIABLES AND DISTRIBUTIONS 9+3

Discrete and continuous random variables - distribution function and its properties - probability mass function and probability density function - discrete and continuous probability distributions - Binomial, Geometric, Poisson, Uniform, Exponential and Normal distributions.

MODULE III MOMENT GENERATING FUNCTIONS 9+3

Expectation of a random variable - probability generating function - properties - moment generating function-moments.

MODULE IV TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint, marginal and conditional distribution functions - independence of random variables-convolution- Generating functions.

MODULE V CORRELATION AND REGRESSION 9+3

Correlation coefficient and regression - rank correlation - curve fitting by least square methods - fitting a straight line, parabola, power curve and exponential curves.

L - 45 ; T-15; Total Hours – 60

TEXT BOOKS:

1. Miller, I.; Miller, M.; "Mathematical statistics", 7th Edition. Prentice Hall International, New Jersey 1999
2. Dr. P. Kandaswamy, Dr. K. Thilagavathy and Dr. K. Gunavathy, Probability and Queuing Theory, 3rd Edition, S. Chand Publishing, New Delhi 2013.

3. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw Hill, NewDelhi 2014.

REFERENCES:

1. Ross,S.M., "Probability and Statistics for Engineers and Scientists" John Wiley & Sons, New Jersey 2007
2. S.C Gupta, V.K Kapoor, "Fundamentals of mathematical statistics", Sultan chand and sons , New Delhi, 2019
3. S.C Gupta,V.K Kapoor, "Fundamentals of Applied statistics ", Sultan chand and sons , New Delhi, 2017
4. LopuhaäC., ,Dekking, F.M.,Kraaikamp, H.P.,Meester, L.E. "A Modern Introduction to Probability and Statistics", 2nd Edition, Springer text series, 2005
5. Chin Long chiang, "Statistical Methods of Analysis ", World Scientific Books, 2003.

COURSE OUTCOMES: At the end of the course students will be able to

CO1: solve basic problems in probability and apply Baye's theorem

CO2: solve problems using standard probability distributions

CO3: derive moment generating functions and use them to evaluate moments.

CO4: find the marginal and conditional distributions of two dimensional random variables

CO5: calculate correlation and regression lines for the given data

Board of Studies (BoS) :

12th BOS of Mathematics & AS held on
23.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M														
CO2	M														
CO3	M														
CO4	M														
CO5	H														

SDG 4: Ensure inclusive and equitable quality education and promote lifelong opportunities for all.

Learning of various statistical methods will lead to knowledge of applications in Data Science and Computing

CAD 1201	OOPS WITH C++	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand Object Oriented Programming concepts and basic characteristics of C++.

COB2: Relate the concepts of objects and classes with real world concepts and models.

COB3: Understand the concepts of operator overloading.

COB4: Become skilled at utilizing the principles of inheritance and interfaces.

COB5: Define data members and member functions in a class.

MODULE I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING 9

Concept of Object orientation – comparison with procedural and structured programming – Classes and objects – Data Abstraction, Encapsulation, Dynamic binding, Message passing. Advantages of object orientation -Basic data types and declarations.

MODULE II CLASSES AND OBJECTS 9

Classes and objects in C++, access modifiers, static members, friend functions, Constructors and Destructors, polymorphism, Operator Overloading and type conversion.

MODULE III INHERITANCE 9

Inheritance - parent and child classes, private, public and protected inheritance, multiple inheritances and multi-level inheritance, Virtual base classes.new and delete operators, objects.

MODULE IV POLYMORPHISM AND EXCEPTION HANDLING 9

Binding & Polymorphism: Early binding, Late Binding, Pointers to derived class objects, virtual functions, Pure virtual functions, exception handling in C++: try, throw and catch.

MODULE V FILE STREAM CLASSES AND TEMPLATES 9

Study of File stream classes in C++-Templates–class and function templates, Templates versus macros, String objects in C++, Standard Template Library in C++.

L –45; Total Hours –45

TEXT BOOKS:

1. E.Balaguruswamy: Object Oriented Programming withC++, Tata McGraw Hill. Publications ,6th edition2013

REFERENCES:

1. BjarneStroustrup, " The C++ Programming Language", Addison Wesley, 4th edition, ISBN-13: 978-0321563842, 2013.
2. Herbert Schildt, "C++ The Complete Reference", Tata McGraw Hill fourth Edition, 2003.

COURSE OUTCOMES:

CO1: Comprehend the concepts of object Oriented Programming Concepts and their significance in real world.

CO2: Learn to co-relate relationship among different entities involved in a system

CO3: Design classes using the inheritances concepts.

CO4: Develop programs using the concepts of Polymorphism and utilize the techniques of Exception Handling.

CO5: Handle data through files systems.

Board of Studies (BoS) :

15thBoS was held on 22.06.2021

Academic Council:

17th AC held on 5.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1		H												
CO2							H							
CO3			H				H							
CO4			H											
CO5					M			M						

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9:Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement:Object Oriented Programming concepts taught in this course for the learners with respect to the course outcomes are measurable and useful in applying one's disciplinary knowledge and transferable skills to new/unfamiliar contexts. As the future industrial personnel, the learner would be able to demonstrate competence in the practical art of computing by identifying, analyzing problems and seek solutions to real-life problems.

Uses Linux?- Understanding How Linux Differs from Windows- Using Ubuntu - Working with Files-Listing Files-Copying Files and Directories -Moving Files and Directories - Deleting Files and Directories - Changing and Creating Directories- Users and File Permissions.

L –45 ; Total Hours –45

TEXT BOOKS:

1. Silberschatz, Galvin & Gagne, 8thEdition, “Operating Systems”, Wiley publications,2012

REFERENCES:

1. Operating System by William Stallings, 4thedition,PearsonEducation,2012
2. Operating System by H.M.Deitel, 2ndEdition, Pearson Education, 2002.
3. Operating Systems by Nutt, 3rdPearsonEducation, 2004.
4. Beginning Ubuntu Linux, Keir Thomas, Andy Channelle and Jaime Sicam, 4thedition, 2009.

COURSE OUTCOMES:

CO1: Provide conceptual process management solution and solve problems using CPU Scheduling algorithms.

CO2: Solve problems related to page replacement algorithms.

CO3: Schedule Input and output requests (I/O requests) with conceptual clarity and solve problems using disk scheduling algorithms.

CO4: Create directories and files in Linux.

CO5: Store data, information efficiently and retrieve them effectively by applying Linux file management operations.

Board of Studies (BoS) :

15Th BoS of CA Meeting held on
22.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	P O4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	M	L	H										H	
CO2			H										H	
CO3			H										H	
CO4					M									L
CO5								H	M		M		H	L

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The learner would be able to introduce the open source operating systems and build the computerized ecosystem for the enterprise in a cost effective manner. The outcomes of the course are measurable and would enable the learner to be productive in industrialization process with innovative computerization ideas.

GED 1207	ENVIRONMENTAL STUDIES	L	T	P	C
SDG: All		2	0	0	2

COURSE OBJECTIVES:

To make the student conversant with the

COB1: Various natural resources, availability, utilisation and its current scenario.

COB2: Diverse ecosystems and its function, importance of biodiversity, its values, threats and conservation.

COB3: Types of pollutants and its impacts on the environment and the effects of natural disasters.

COB4: Impacts of human population, human health, diseases and immunisation for a sustainable lifestyle.

MODULE I	MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	8
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Definition, scope and importance, Need for public awareness.

Natural resources and associated problems (a) Land resources: Land as a resource, land degradation, soil erosion and desertification - (b) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forest and tribal people - (c) Water resources: Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems, Water conservation: rain water harvesting, watershed management - (d) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, mining - (e) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture - (f) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

MODULE II	ECOSYSTEMS AND BIODIVERSITY	8
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Ecosystems: Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a) Terrestrial Ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem (b) Aquatic fresh water ecosystems: Ponds and lakes, rivers and streams (c) Aquatic salt water ecosystems: oceans and estuaries.

Biodiversity: Classification: genetic, species and ecosystem diversity; Bio-geographical classification of India and India as a mega-diversity nation; Invasive, endangered, endemic and extinct species; Hot spots of biodiversity and Red

Data book; Values of biodiversity, Threats to biodiversity; Conservation of biodiversity.

MODULE III ENVIRONMENTAL POLLUTION AND ITS CONTROL 8

Definition, Cause, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards, (h) ill-effects of fireworks and upkeep of clean environment - El Nino and La Nina.

Solid waste Management - Causes, effects and control measures of urban, industrial wastes and e-waste - Disaster management: flood, drought, cyclone, landslide, avalanche, volcanic eruptions, earthquake and tsunami.

MODULE IV HUMAN POPULATION, SOCIAL ISSUES AND HEALTH 6

Population, population growth, variation among nations; population explosion; Family Welfare Programme - Unsustainable to sustainable development - Resettlement and rehabilitation of people - Environment Protection Act - Public awareness - Human Rights - Value Education - Women and Child Welfare - HIV/AIDS - Environment and human health: air-borne, water borne, infectious diseases, contagious diseases and immunization (all types of vaccines from birth), risks due to chemicals in food and water, endocrine disrupting chemicals, cancer and environment.

Case studies related to current situation.

L – 30; Total Hours – 30

TEXT BOOKS:

1. ErachBharucha, "Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education for University Grants Commission", Orient Blackswan Pvt. Ltd., Hyderabad, India, 2013.
2. Benny Joseph, "Environmental Studies", Tata McGraw-Hill Education, India, 2009.
3. Ravikrishnan A, "Environmental Science and Engineering", Sri Krishna Publications, Tamil Nadu, India, 2018.
4. Raman Sivakumar, "Introduction to Environmental Science and Engineering", McGraw Hill Education, India, 2009.
5. Venugopala Rao P, "Principles of Environmental Science and Engineering", Prentice Hall India Learning Private Limited; India, 2006.
6. Anubha Kaushik and Kaushik C.P., "Environmental Science and Engineering", New Age International Pvt. Ltd., New Delhi, India, 2009.

REFERENCES:

1. Masters G.M., "Introduction to Environmental Engineering and Science", Prentice Hall, New Delhi, 1997.
2. Henry J.G. and Heike G.W., "Environmental Science and Engineering", Prentice Hall International Inc., New Jersey, 1996.
3. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Co. Boston, USA, 2016.
4. "Waste to Resources: A Waste Management Handbook", the Energy and Resources Institute, 2014.
5. <https://www.teriin.org/article/e-waste-management-india-challenges-and-opportunities>.
6. <https://green.harvard.edu/tools-resources/how/6-ways-minimize-your-e-waste>.
7. <https://www.aiims.edu/en/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html>.
8. <https://tspcb.cg.gov.in/Shared%20Documents/Guidelines%20for%20Management%20of%20Healthcare%20Waste%20Waste%20Management%20Rules,%202016%20by%20Health%20Care%20Facilities.pdf>.

COURSE OUTCOMES:

The student will be able to

CO1:analyse the current scenario of various natural resources and their depletion and suggest remedies to curb the exploitation.

CO2:identify food chains and web and its function in the environment, assess the impacts on the biodiversity and propose solutions to conserve it.

CO3:analyse the types and impacts of pollutants in the environment and propose suitable methods to alleviate the pollutants and the natural disasters.

CO4:assess the impact of human population and the health related issues and immunisation practices and sustainable developments for a healthy life

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Board of Studies (BoS) :

11thBoS of Chem held on
17.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	L	M	-	-	L	M	-	-	-	-	-	-	-	-
CO2	-	-	-	M	H	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	M	M	-	-	L	-	M	-	-
CO4	-	-	-	-	-	M	M	M	-	-	-	L	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG All: No Poverty, Zero Hunger, Good Health and Well-Being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable & Clean Energy, Decent Work and Economic Growth, Industry, Innovation & Infrastructure, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace, Justice and Strong Institutions, Partnerships for the Goals.

Statement: This course discuss about the environment, all the natural resources available, sharing of resources, effective utilization, effects of over utilisation, health and environmental issues pertained to that, global warming and related issues, climates, disasters, impact assessments, population, human rights, societal welfare, laws to conserve the environment and sustainability.

CAD1203	OOPS WITH C++ LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

COB 1: Understand and solve logical & mathematical problems using Object Oriented Programming concepts.

COB 2: Design and develop programs using classes and objects

COB 3: Develop programs using Inheritance and constructors.

COB 4: Design and develop programs using Polymorphism and Exception Handling mechanisms.

COB 5: Develop programs using file stream classes

PRACTICALS

List of Experiments:

1. Write a C++ program to generate all the prime numbers between 1 and n using control structures.
2. Write a C++ program to sort a list of numbers in ascending order using Array.
3. Write a program to print the values of the variables using Scope resolution operator .
4. Program using classes, Objects and Data member functions.
5. Write a C++ program to implement array of objects.
6. Write a C++ program to implement friend functions
7. Write a C++ program to count the number of objects created using static data member function.
8. Write a C++ program to implement function overloading and operator overloading.
9. Using operator overloading concept implement arithmetic manipulation on two complex numbers.
10. write a C++ program to demonstrate the use of constructors and destructors
11. Create a base class for a stack and implement push and pop operation. Include a derived class to check for stack criteria such as
a) Stack empty b) Stack full c) Stack overflow
d) Stack underflow.
12. Create a file called **student** and include the following fields:
Student- name, Student's Reg No, Student's Attendance (overall % of attendance); and enter data for 10 students and output the same in proper format.

13. Write a C++ program to implement Virtual Function.
14. Program using Exception Handling Mechanism (Try, Throw and Catch).
15. Write a C++ program to sort the numbers using Function Templates.

P – 60; Total Hours - 60

TEXT BOOK:

1. E.Balaguruswamy: Object Oriented Programming withC++, Tata McGraw Hill Publications,2015.

REFERENCES:

1. Stroustrup: The C++ Programming Language, Pearson Edition, 3rdEdition 2010.
2. Herbert Schildt, "C++: The Complete Reference", Tata McGraw Hill fourthEdition, 2003

COURSE OUTCOMES:

On completion of this course the students will be able to:

CO 1: Implement Object Oriented programming concepts

CO 2: Create classes & objects and understand their usages

CO 3: Implement inheritances, Constructors and Polymorphism

CO 4: Identify, understand and analyze various development models

CO 5: Manipulate data through File and Templates.

Board of Studies (BoS) :

15thBoS was held on 22.06.2021

Academic Council:

17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
CO1	H											H		H	
CO2						H						L			
CO3		M				H						M			H
CO4		H											H		H
CO5				M			M						H		

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 :Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: By understanding the object oriented features, the students will be able to apply the knowledge to derive solutions to computing problems. Apply object oriented principles in software design process; the students will be able to analyze complex problems in the domain of software development with better effectiveness.

CAD 1204	LINUX LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:**COB1:** Installation of Linux operating system.**COB2:** Execute the basic commands of UNIX.**COB3:** Understand the functionality and modes of VI Editor.**COB4:** Implement the concepts of UNIX.**COB5:** Create shell program in UNIX.

List of Programs:

1. How to install LINUX.
2. Execute 25 basic commands of UNIX.
3. Basics of functionality and modes of VI Editor
4. Create a file called vegetables and add the contents as follows
 - Brinjal
 - Carrot
 - Onion
 - Potato
 - Tomato

Create one more file called Fruits and add the contents as follows

- Apple
 - Banana
 - Cherry
 - Kiwi
 - Peach
- a) Display the contents of the vegetables file on screen.
 - b) Concatenate vegetables and fruits file and display the result.
 - c) Show the difference between fruits and Vegetables.
 - d) Add the content in the Fruits file as Mango, Grape.
5. Create a directory called Foods
 - a) Move vegetables and fruits to foods directory.
 - b) Remove vegetables files from foods.
 - c) Comes out from foods.
 - d) List all the files from this directory.
 - e) Display all hidden files from the directory.
 6. Display the detailed result for the below
 - a) Get manual help and display the detailed information about bash

- b) Display the time to be taken for executing a file
 - c) Change the mode of a fruits file to Read only to all users
 - d) Count the number of words in vegetables file.
 - e) Count the Number of Characters in Fruits file.
7. Create a file in vi editor and do the following
- a) Type 1-10 numbers and repeat it for two times using macros.
 - b) Find the current working directory inside vi editor
 - c) Open two files horizontally
 - d) Add line numbers
 - e) Split the window
 - f) Search all the occurrences of the word TEXT.
8. Create a file in vi editor and do the following
- a) Insert a line in the beginning and end of line.
 - b) Yank the last line of the text and paste as first line.
 - c) List all the files with detailed information from this directory inside vi editor
 - d) Change all the occurrences of the word TEXT to UNIX
Swap first and second paragraph.
9. Disk related commands and communication commands in Unix
- a) Find the disk used space in your directory.
 - b) Find disk free space in your directory with options.
 - c) Send message to all users, "To shut down the System".
 - d) Block other user from writing in your terminal.
 - e) Find the disk usage.
10. Write a shell program to print all odd numbers between 10-30.

P-60; Total Hours - 60

TEXT BOOKS AND REFERENCES:

1. The Operating System Linux and Programming Languages an Introduction Joachim Puls and Michael Wegner, 2010, 1st edition.
2. Beginning Ubuntu Linux, Keir Thomas, Andy Chappelle and Jaime Sicam, 4th edition, 2009.

COURSE OUTCOMES:

CO1: Installing Linux Operating System in machine.

CO2: Implement basic commands of UNIX.

CO3: Develop skills on the concepts of UNIX.

CO4: Create shell program in UNIX.

CO5: Implement GNU tool chain with Eclipse IDE

Board of Studies (BoS) :15thBoS was held on 22.06.2021**Academic Council:**17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	L							L				M		M
CO2		M	H										M	
CO3												M	H	
3CO4				L	M						M		L	M
M		H	H		H				L			H	H	M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: To analyze, design and develop Linux skills Practically taught in this course for the learners with respect to the course outcomes are measurable. Learners will pursue research and to become a software Professionals through innovative approach.

CAD 2101	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES :

COB1: Design and develop efficient algorithms with minimum complexity using design techniques.

COB2: Understand the problems and design algorithms.

COB3: Study various algorithmic techniques.

COB4: Develop correct and efficient algorithms for solving a given problem.

COB5: Enables to analyse efficient algorithms for numerous applications.

MODULE I INTRODUCTION 9

Notion of an Algorithm – Fundamentals of Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive algorithm and Non-recursive algorithms.

MODULE II DIVIDE AND CONQUER TECHNIQUE 9

Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication.

MODULE III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm.

MODULE IV BACKTRACKING AND STRING MATCHING 9

Backtracking – N-Queens problem – Hamiltonian circuit problem – Subset sum problem - The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.

MODULE V NP-COMPLETENESS 9

The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.

L - 45; Total Hours - 45

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2017.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2018.

REFERENCES :

1. Donald E. Knuth, The Art of Computer Programming, Pearson Education, 2016.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T. Tsai, Introduction to the Design and Analysis of Algorithms A Strategic Approach, TMH, 2012.

COURSE OUTCOMES :

Students who complete this course will be able to,

CO1: gain a clear understanding of the algorithm and basic frame work of algorithm development and learn to implement the algorithm notations.

CO2: solve the algorithmic problems using different strategies.

CO3: employ graphs to model engineering problems and provide elucidations.

CO4: perform efficient back tracking and string matching by applying various algorithms

CO5: implement and understand NP-Hard and deal with NP-complete problems.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			H	M	H		L							L
CO2			M		L								M	
CO3					M						L		L	H
CO4		L	M		H									
CO5			H		M								M	

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The learner will be able to analysis and design algorithms with appropriate methods and techniques.

CAD2102	SOFTWARE ENGINEERING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the phases in a software project

COB2: Familiarize the learners with fundamental concepts of requirements engineering and Analysis Modelling

COB3: Learn knowledge representation about Design and Development

COB4: Learn various testing and maintenance measures

COB5: Ability to apply software engineering principles and techniques.

MODULE I INTRODUCTION 9

The Evolving role of Software – The changing Nature of Software -Legacy software- A Process Framework – Process Assessment - Personal and Team Process Models – Product and Process – Process Models - The Waterfall Model – Incremental Process Models – Incremental Model – The RADModel– Evolutionary Process Models - Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models –Unified Process.

MODULE II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document - Requirement Engineering Process: Feasibility Studies, analysis, requirements, validation, requirements management-Classical analysis: Structured system Analysis.

MODULE III SOFTWARE DESIGN AND DEVELOPMENT 9

Design process — Design Concepts-Design Model– Design Heuristic — Architectural Design -Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design.

MODULE IV SOFTWARE TESTING AND IMPLEMENTATION 9

Software testing fundamentals-Internal and external views of Testing-white box testing - Basis path testing-control structure testing-black box testing- Unit Testing - Integration Testing - Validation Testing - System Testing and Debugging - Software Implementation Techniques.

MODULE V**9****SOFTWARE MAINTENANCE AND PROJECT MANAGEMENT**

Maintenance and Reengineering-Reengineering process model-Reverse and Forward Engineering. Software Project Management: Estimation - LOC, FP Based Estimation, COCOMO I & II Model - Project Scheduling - Scheduling, Earned Value Analysis Planning - Project Plan, Planning Process, Risk Management - Identification, Projection - Risk Identification-Case Tools.

L - 45;Total Hours - 45**Board of Studies (BoS) :**16thBoS was held on 23.12.2021**Academic Council:**18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1				L			H						H	
CO2		H	H	M									H	
CO3							H				M			H
CO4				M			H							M
CO5							H	H			H		M	

TEXT BOOKS:

1. Ian Sommerville, "Software Engineering"- 10th Edition, Pearson, 2016.
2. Roger S. Pressman, "Software Engineering – A Practitioner 's Approach", Seventh Edition, Mc Graw-Hill International Edition, 2010.

REFERENCES:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited ,2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010
3. Karl& Joy Beatty," Software Requirements", 3rd Edition, Microsoft Press, 2012.
4. S.K.Kataria, Rajiv Chopra, "Object Oriented Software Engineering", 3rd Edition, 2013.

COURSE OUTCOMES:**CO1:** Identify the key activities in managing a software project.

CO2: Apply the Concepts of requirements engineering and Analysis Modeling.

CO3: Apply systematic procedure for software design and deployment.

CO4: Compare and contrast the various testing methods.

CO5: To gain the knowledge of how Maintenance processes are conducted in a software project.

Note:L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

Software Engineering help the leaners to inculcate the tools for making business decisions and to implement real time projects. Software testing help the companies for better understanding of the needs, expectations of their customers, improve the efficiency of customer service, market research carried out on social channels and increases their competitive intelligence.

CAD 2103	RELATIONAL DATABASE MANAGEMENT	L	T	P	C
SDG: 9	SYSTEMS	3	0	0	3

COURSE OBJECTIVES:

COB1:To learn the fundamentals of data models and to represent a database system using ER diagrams.

COB2:To create a physical database from a design using DDL statements with appropriate key and constraints

COB3:To master the basics of SQL Views, Index and Triggers construct queries

COB4:To map ER into Relations and to normalize the relations

COB5:To understand the fundamental concepts of transaction processing-concurrency control techniques and recovery procedures.

MODULE I INTRODUCTION 9

Purpose of Database System - Views of data - Data Models - Database Languages - Database System Architecture - Database users and Administrator – Entity Relationship model (E-R model) - ER Diagrams - Introduction to relational databases.

MODULE II DATABASE DESIGN 9

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

MODULE III RELATIONAL MODEL 9

The relational Model - The catalog – Types - Keys - Relational Algebra – Domain Relational Calculus - Tuple Relational Calculus - Fundamental operations – Additional Operations - SQL fundamentals (Table, Create, Select, Clause, Order by, Group by, Insert, Update, Delete, Join) – Data Constraints.

MODULE IV SQL VIEWS, INDEX AND TRIGGERS 9

Operations on Views - Integrity - Triggers - Security - Advanced SQL features - Embedded SQL - Dynamic SQL - Missing Information – Introduction to Distributed Databases and Client/Server Databases.

MODULE V TRANSACTION PROCESSING AND CONCURRENCY 9 CONTROL

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock- Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency.

L - 45; Total Hours - 45

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill, Seventh Edition, 2020.
2. C.J.Date, A .Kannan, S.Swamynathan, "An Introduction to Database Systems ", Pearson Education, Eighth Edition, 2006.

REFERENCES:

1. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson / Addison Wesley, Seventh Edition, 2016.
2. Raghu Ramakrishnan, "Database Management Systems", McGrawHill, Third Edition, 2003.
3. S.K.Singh, "Database Systems Concepts, Design and Applications", Pearson Education, Third Edition, 2009.

COURSE OUTCOMES: Students will be able to

CO1: Identify the data models for relevant problems and design ER diagram

CO2: Develop Relational Algebra and Relational Calculus queries

CO3: Effectively designs basic and advanced SQL queries to retrieve data from the database.

CO4: Applies various Normalization techniques for database design improvement.

CO5: Demonstrate their understanding of key notions of transaction processing and concurrency control.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H											M		
CO2		H			H									H	
CO3		H			H				H					H	
CO4			H						H				M		
CO5			H												

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9:Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

DBMS aids organizations in optimizing, storing, retrieving, and managing data in databases. It acts as a link between the database and the end user, ensuring that data is well-organized and accessible. Effective database management systems promote organizational data accessibility, allowing end users to share data more rapidly and effectively across the business. A management system aids in the rapid resolution of database queries, allowing for faster and more accurate data access.

CAD 2104	COMPUTER NETWORKS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to help students to:

COB1: Understand the concept of layering in networks.

COB2: Learn about the various functions of physical and data link layer.

COB3: Know the principles of Circuit switching and Packet switching

COB4: Visualize the end-to-end flow of data.

COB5: Learn about the functions of Application Layer protocol

MODULE I INTRODUCTION 9

Data Communications - Data Communications Networking - Layered Architecture – OSI Model – Internet Architecture (TCP/IP) - Data Transmission media - Concepts and terminology - Networking Devices: Hubs, Bridges, Switches, Routers, and Gateways.

MODULE II PHYSICAL LAYER AND DATA LINK LAYER 9

Data encoding - Digital data Digital signals, Digital data Analog signals, Analog data Analog signals - Data link control: Framing - Flow control - Error Detection - Error Control - High Level Data Link Control (HDLC) - Media Access Control – Ethernet Basics.

MODULE III NETWORK LAYER 9

Network Layer: Internet Protocol – IPv4 Packet Format – Drawback of IPv4 - Internet Protocol version 6 (IPv6) - Benefits of IPv6 - IPv6 addressing - IPv6 Security - IPv6 Packet Structure- IP Addressing – Sub netting – Address Resolution Protocol (ARP) – Reverse Address Resolution Protocol (RARP) - Internet Control Message Protocol (ICMP) – Concept of SDN - Circuit switching: Circuit switching networks switching concepts - Routing in circuit switched networks - Packet switching principles - Routing in packet switching.

MODULE IV TRANSPORT LAYER 9

Transport Layer functions – Multiplexing and De multiplexing – User Datagram Protocol – UDP Applications – Transmission Control Protocol – Flow Control – Retransmission Strategies – Congestion Control.

MODULE V APPLICATION LAYER**9**

Application Layer protocols – HTTP – FTP – SMTP – SNMP – DNS – Case study

Applications: ping and traceroute commands.

L - 45; Total Hours - 45**TEXT BOOKS:**

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.

2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2014.

REFERENCES:

1. Douglas E. Comer, Internetworking with TCP/IP, Principles, protocols, and architecture, Vol. 1 5th Edition, 2006.

2. Behrouz A. Forouzan, Introduction to Data Communication & Networking, Mc. Graw Hill Publishers, 4th edition 2007.

COURSE OUTCOMES:

On completion of this course the students will be able to,

CO1: Identify the key functions of different network devices.

CO2: Identify the functions of Flow control and Error Control.

CO3: Apply the addressing principles such as subnetting to design different sizes of networks.

CO4: Analyze and compare transport layer protocols.

CO5: Compare the function of Application protocols.

Board of Studies (BoS):

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	L	L	M	M			M							M
CO2	H	H												M
CO3			H	H	H	M							H	
CO4			M	M	M	M		H					H	
CO5			H					H						M

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9:Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Computer Networks help the learners to know network structure, gain the knowledge of functions of each layer, IP addressing and to learn about the functions of networking devices and various protocols. The network designers are carried out the research on constructing efficient and secured networks to build various types networks.

CAD2105	PROGRAMMING IN JAVA	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Provide basic fundamentals of Java Programs

COB2: Explore classes ,Inheritances and Packages

COB3: Understand how exception handling works in Java

COB4: Read and write data using Java streams

COB5:. Demonstrate the use of AWT packages and Events

MODULE I INTRODUCTION 9

Brief History of Java, Special Features of Java, Key words- Data Types Primitive and Non primitive data types -Variables-Expressions-Operators in Java, Control Structures, Decision making and Branching Looping statements – Arrays – Strings.

MODULE II CLASS AND INHERITANCE 9

The Java Class - Defining a Class-Accessing class members- Constructors - Inheritance, Extending a class, Method Over-riding, Method Overloading, Access Modifiers, Abstract Class and Method, Interfaces, - Defining Interfaces –Extending Interfaces -Packages, creating a package - Imports and Class Path.

MODULE III THREADS AND EXCEPTION HANDLING 9

Threads: Introduction, Creating Threads in Applications- Thread Priority.-Life cycle of a thread –Implementing Runnable Interface –Exceptions- Types of Errors-The Try-Catch Statement and Throw Multiple Catch statements-Finally block.

MODULE IV FILES AND I/O STREAM CLASSES 9

File Class- Working with File Object, File I/O Basics, Creation of Files Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File. Concepts of streams –Stream Classes - Byte stream classes-Character stream classes - Input Stream Classes, Output Stream Classes.

MODULE V APPLETS AND GRAPHICAL USER INTERFACE DESIGN 9

Applet, Applets Life Cycle –Components and Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components, , Loading and Viewing Images, Event Handling mechanism – Event Classes - Introduction to Java Database connectivity –JDBC Drivers

and Architectures.

L - 45; Total Hours - 45

TEXT BOOKS:

- 1.E.Balagurusamy ,” Programming with Java” 6th edition, McGraw-Hill Education, 2019.
- 2.Hortsmann& Cornell, "Core Java Advance Features VOL II", 9thEdition, PearsonEducation,2015.

REFERENCES:

- 1.Patrick Naughton, "Complete Reference: JAVA 2", 8th Edition, Tata Mc Graw Hill,July 2017.
- 2.Andrew Lee Rubinger, Bill Burke "Enterprise JavaBeans 3.1", 6thEdition, O'Reilly Publishers,2012.

COURSE OUTCOMES:

Students will be able to

CO1: identify classes, objects, members of a class and relationships among them needed for a specific problem.

CO2:write Java application programs using OOP principles.

CO3: demonstrate the concepts of polymorphism and inheritance.

CO4: write Java programs to implement error handling techniques using exception handling.

CO5: develop Java programs using Applets and AWT packages .

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	P O3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H												M	
CO2		H			H								H		
CO3		H			H				H						H
CO4			H						M				M		
CO5			H												

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 :Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement : :Programming logics, design and developments taught in this course for the learners with respect to the course outcomes are measurable and useful in improving the programming skill of the learner.. Apply object oriented principles in software design process, the students will be able to analyze complex problems in the domain of software development with better effectiveness

CAD 2106	RELATIONAL DATABASE MANAGEMENT	L	T	P	C
SDG: 9	SYSTEMS LABORATORY	0	0	4	2

COURSE OBJECTIVES:

The objective of this course is to

COB1: impart knowledge in the basics of relational database management system.

COB2: focus on writing SQL queries and demonstrate the use of constraints.

COB3: access and manipulate database using views and index.

COB4: illustrate the functionalities of PL/SQL programming.

COB5: learn to design and access the real time database.

List of Programs:

1. Demonstrate DDL commands, DML commands, DCL commands and TCL commands.
2. Design relations to implement the integrity constraints (primary key, foreign key, unique and check constraints).
3. Apply aggregate functions to group the values of multiple rows.
4. Implement group by functions with having clause.
5. Retrieval of data from one or more relations with nested sub queries.
6. Apply join operations to retrieve data from multiple relations.
7. Construct views from a single table/ multiple tables and demonstrate the manipulation of views.
8. Create Synonyms, Sequences and Index and perform SQL operations on it.
9. Demonstrate the concepts of looping, cursors and exception handling using PL/SQL statements.
10. Develop PL/SQL functions with select and update statements.
11. Develop stored and unnamed PL/SQL procedures to retrieve data from a relation.
12. Demonstrate the execution of Triggers whenever the insertion or deletion event occurs in the database.
13. Application Development using Oracle/ SQL SERVER / MYSQL / POSTGRES / Db2

P - 60; Total Hours - 60

TEXT BOOKS:

1. Alan Beaulieu, "Learning SQL - Generate, Manipulate, and Retrieve Data", O'Reilly, 3rd Edition, 2020.
2. Steven Feuerstein, Bill Pribyl & Chip Dawes, "Oracle PL/SQL Language Pocket Reference", O'Reilly, 5th Edition, 2015.
3. Felix Alvaro, "SQL - Easy SQL Programming & Database Management for Beginners, Your Step-By-Step Guide To Learning The SQL Database" Kindle Edition, 2016.
4. https://docs.oracle.com/cd/E11882_01/server.112/e41085.pdf

REFERENCES:

1. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management Systems", Springer Science & Business Media, 2013.
2. N. P. Singh, C.S. Gupta, "Relational Database Management Systems", Abhishek Publications, 2014.

COURSE OUTCOMES:

Students who complete this course will be able to

CO1: create and manipulate databases using SQL queries.

CO2: retrieve data using Nested sub queries and Join Queries.

CO3: perform indexing on database and manipulate SQL queries on views.

CO4: manipulate database using PL/SQL functions and procedures.

CO5: develop database applications for the real-world problems.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	M										H	M
CO2	L	L	M										H	M
CO3	M	M	M										H	M
CO4	M	M	M										H	M
CO5	M	M	M							M			H	M

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement :The knowledge gained by the learner in this course will help them significantly improve their understanding and implement the concepts learned in real world applications to store and retrieve data effectively.

CAD 2107	PROGRAMMING IN	L	T	P	C
SDG: 9	JAVA LABORATORY	0	0	4	2

COURSE OBJECTIVES:

COB1: Develop the programming skills using the object oriented programming methodology to produce quality computer based solutions to real problems.

COB2: Utilize the advance features of Java technology.

COB3: Applying the major object-oriented concepts to implement programs, Inheritance and Polymorphism

COB4: Develop a program to handle exceptions.

COB5: Work with collection API and develop fast programs.

LIST OF EXERCISES:

1. Programs using basic data types, operators and control structures.
2. Class definitions and usage involving variety of constructors and finalizes
3. Programs involving various kinds of inheritances,
4. Program to demonstrate creation and handling of packages, their imports and Class Path.
5. Programs involving a variety of Exception Handling situations
6. Program involving creating and handling threads in applications and applets.
7. Program to demonstrate AWT/Swing graphic methods
8. Program for Loading and Viewing Images, Loading and Playing Sound
9. Programs to demonstrate various Layouts
10. Programs to demonstrate event handling
11. Program that connects to a database using JDBC
12. Program to connect to database using JDBC & insert values into table
13. Program to connect to a database using JDBC and delete values from table.

EXTRA PROGRAMS:

1. Write a program to create a frame using AWT. Implement mouseClicked(), mouseEntered() and mouseExited() events. Frame should become visible when mouse enters it
2. Using AWT, write a program to display a string in frame window with pink colour as background.
3. Using AWT, write a program to create two buttons named "Red" and "Blue". When a button is pressed the background colour should be set to the colour named by the button's label.

P - 60; Total Hours - 60

TEXT BOOKS:

1. Patrick Naughton, "Complete Reference: JAVA 2", 8th Edition, Tata McGrawHill, 2011.

REFERENCES:

1. Keyur shah, "Gateway to Java Programmer Sun Certification", Tata McGraw Hill 2002.
2. Herbert Schildt, The Complete Reference – Java 2, 4th Edition, Tata McGraw Hill,2007.

COURSE OUTCOMES:

CO1: Implement Java classes from specifications.

CO2 : Effectively create and use objects from predefined class libraries

CO3: Implement Java classes from specifications

CO4: Implement the concepts of interfaces, inheritance, and polymorphism

CO5: Develop programs using Applet.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L		H											
CO2		M	M											
CO3							M							
CO4	M		L							L				
CO5			M											L

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 9:Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Aims to implement real-world entities like inheritance, hiding, polymorphism etc in programming. Mainly it is used create application based on object oriented concepts.

GED 2102	APTITUDE AND INTERPERSONAL	L	T	P	C
SDG: 8	SKILLS	0	0	2	1

COURSE OBJECTIVES:

COB1:To enhance problem solving skills

COB2:To train the students to face competitive examination

COB3:To recognize communication barriers and act accordingly

COB4:To learn the nuances of Group discussion and basic Etiquettes.

MODULE I GENERAL MENTAL ABILITY 8

Problems on Age - Time & Work – Speed, Distance & Time – Problems on Train - shortcut techniques - Simple & Compound Interest.

MODULE II QUANTITATIVE APTITUDE AND REASONING 7

Percentage - Profit & Loss – Ratios and Proportions –Verbal Reasoning: Direction, Blood relations, Calendar and Clocks

MODULE III COMMUNICATION AND INTERPERSONAL SKILL 7

Communication skill - Effective listening skills – Problem Solving – Positive Attitude – Maintaining Trust.

MODULE IV PERSONALITY DEVELOPMENT 8

Presentation skills - Group Discussion techniques - Grooming Basics – Etiquettes - Body Language.

P – 30 ; TOTAL HOURS - 30

REFERENCES:

1. Bhattacharya.Indrajit (2008).An Approach to Communication Skills, DhanpatRai& Co., (Pvt.) Ltd. New Delhi.
2. Swan, Michael (2005). Practical English Usage, Oxford University Press.
3. Tyra .M, Magical Book On Quicker Maths, BSC Publishing Company Pvt. Limited, 2009
4. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Limited, 2017
5. R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Limited, 2010
6. KhattarDinesh, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 3e, Pearson India , 2016.

7. Bhattacharya. Indrajit, An Approach to Communication Skills, DhanpatRai& Co., (Pvt.) Ltd. New Delhi, 2008
8. Swan, Michael, Practical English Usage, Oxford University Press, 2005
9. P.A. Anand , Wiley's Quantitative Aptitude, 1st Edition,Wiley,2015
10. InduSijwali, A New Approach to Reasoning Verbal & Non-Verbal, Arihant Publications India limited, 2018
11. DishaExperts , Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams 2nd Edition, Disha Publication, 2018
12. Jaikishan, Premkishan, How to Crack Test Of Reasoning, Arihant Publications India limited, 2018.

COURSE OUTCOMES:

CO1: Apply the concept of aptitude in competitive examination

CO2: Identify simple methods and solutions on problem solving

CO3: Break the glass ceiling and the hurdles of communication barriers

CO4: Present them self positively and master the art of Group discussion and basic etiquettes.

Board of Studies (BoS) :

13thBoS of Department of English
held on 17.6.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10
CO1					L				L	
CO2					M					
CO3								M		
CO4								M		

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG No. 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

This Course offers the employability and creates decent working environment.

SEMESTER IV

CAD 2201	PYTHON PROGRAMMING	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB 1: Introduce the basic concepts of python programming with values and variables.

COB 2: To know the basic arithmetic expression and conditional statement in python.

COB 3: To understand the code reusability by using function concept.

COB 4: Explore the various python data collection techniques.

COB 5: Understand the logic of array and file handling techniques in python environment.

MODULE I INTRODUCTION 9

Introduction to Python Programming, development tools, values and variables, integer values, variables and assignment, identifiers, floating point types, control codes with strings, user input, eval function, print function.

MODULE II ARITHMETIC EXPRESSION & CONDITIONAL STATEMENT 9

Expression and arithmetic, operator precedence and associativity, comments and errors, syntax errors, run time errors, logic errors, arithmetic operators. Conditional execution, Boolean expressions, simple if statement, if/else, compound Boolean expressions, nested conditions, decision statements, conditional expressions. Iterations, while statement, definite vs indefinite loops, nested loops, abnormal loop termination.

MODULE III FUNCTIONS & OOPS CONCEPT 9

Functions, standard mathematics functions, time function, random function, importing function, writing own functions, parameter passing, custom function vs standard functions. Global variables, default variables, recursion, reusable functions, functions as data – Exception Handling. OOPS - Class/Objects, encapsulation/data hiding, Inheritance, Polymorphism.

MODULE IV PYTHON COLLECTIONS 9

Lists, List assignment, list bounds, slicing, list and functions, prime

generation with list, sorting, flexible sorting, search, linear search, binary search, list permutation, random permutation, objects, string objects, list objects, Tuples & its operations, Dictionaries & its operations.

MODULE V NUPY, FILE HANDLING & PANDAS BASICS

9

NumPy array attributes – Array indexing – Array slicing – Computation on Numpy Arrays – Aggregations – Sorting arrays. Files I/O -Printing to the Screen - Reading Keyboard Input - Opening and Closing Files - Reading and Writing Files - Renaming and Deleting Files. Pandas Basics – Creation of Data Frame, Manipulation of Data Frame.

P – 45 ; Total Hours - 45

TEXT BOOKS:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, ISBN: 978-1111822705, 2011.
2. Dusty Phillips, Python Object Oriented Programming, PACKT Press, ISBN: 9781789615852, 2018.
3. Jake VanderPlas, Python Data Science Handbook: Essential tools for working with data, O'Reilly Media, CA, 2016.

REFERENCES:

1. Mark Lutz, Programming Python, O'Reilly Media, 5th Edition, 2013.
1. Tony Gaddis, Starting Out with Python, Pearson, 3rd Edition, ISBN-13: 978-0133862256, 2011.
2. Downey, Allen B, Think Python: How to Think Like a Computer Scientist, O'Reilly, 2nd Edition, 2016.
3. David M. Baezly, Python Cookbook, O'Reilly Media, 3rd edition, 2013.

COURSE OUTCOMES:

Students who complete this course will be able to

CO 1: Apply the programming logic in python environment.

CO 2: Provide arithmetic and logical solutions to the real-time applications.

CO 3: Implement the code reusability technique for programming efficiency.

CO 4: Collect various real-time data in appropriate repository for programming.

CO 5: Explore the array data using Numpy& handle data using file system.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			M										H	
CO2					H								H	
CO3				H	M								M	
CO4			M						H				H	
CO5									M		M		H	H

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4:

Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:The Python programming and its techniques were taught in this course. Understanding the insights and importance of python programming will motivate the student to deploy business applications in real-time scenario. The knowledge attained through python programming will improve the skills set of the student to meet industrial demand.

CAD 2203	PYTHON PROGRAMMING LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

COB1: To write, test, and debug simple Python programs

COB2: To implement Python programs with conditionals and loops.

COB3: To learn Syntax and create Functions in Python.

COB4 To represent compound data using Python Lists, Tuples, Dictionaries

COB5: To handle Strings and Files in Python

LIST OF PROGRAMS

1. Write a program for addition, subtraction, multiplication and division of two numbers
2. Write a program to print Fibonacci number series
3. Write a program to incorporate Fizz for any number divisible by 3 and Buzz for any number divisible for 5 and FizzBuzz for any number divisible by 3 and 5 as well.
4. Write a Python program to display Reverse String.
5. Write a Python program to display a Multiplication Table.
6. Write a Python program to display all Prime Numbers between 1 to 10000.
7. Write a Python program to demonstrate the Array Operations and Methods.
8. Write a Python program to demonstrate Recursive Functions.
9. Write a Python program to display all List operations.
10. Write a Python program to demonstrate all Tuple Operations.
11. Write a Python program to demonstrate all Dictionary Operations.
12. Write a program to create a game "Rock, Paper and Scissor"
13. Write a Python program to demonstrate Linear and Binary search.
14. Write a program to convert speech to text.
15. Write a Python program to Create a file, Read the content in a file, Write the content in a file, Delete the content in a file.

P – 60 ; Total Hours - 60

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 2021.
2. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data ", Third Edition, MIT Press, 2021.
3. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

REFERENCES:

1. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.
2. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
3. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
4. <https://www.w3schools.com/python/default.asp>.

COURSE OUTCOMES:

CO1: Examine Python syntax and semantics in the use of Python programs.

CO2: Implement programs in Python using conditionals and loops for solving problems.

CO3: Implement the various functions prototype in Python program.

CO4: Understand and implement various data structures Lists, Tuple, Dictionaries and strings.

CO5: Demonstrate proficiency in handling Strings and File Systems

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	L		M		H	L					L		M	
CO2	M	M	H		H								M	L
CO3	L		H			L							H	
CO4	M		M		L									
CO5	H		M		L	L							L	

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Programming concepts, plan & features are taught in this course for the learners with respect to the course outcomes are measurable and useful in improving the programming and logical skill of the learner. As the software industries growing rapidly, this course will enable the learner to explore various technologies such as web development, Artificial Intelligence, Data Science and IoT by using python programming.

GED 2204	APTITUDE AND WORKPLACE SKILLS	L	T	P	C
SDG: 8		0	0	2	1

COURSE OBJECTIVES:

COB1:To enlighten students with the basic logical reasoning concept

COB2:To prepare the students to face competitive examination

COB3:To efficiently make use of goal setting and to inculcate the elements of being a good leader and a team member

COB4:To prepare the students holistically to face the Personality Test

MODULE I GENERAL MENTAL ABILITY 8

Probability- Permutations & Combinations - Allegations and mixture –Data interpretation.

MODULE II ANALYTICAL AND LOGICAL REASONING 7

Order & Ranking – Seating Arrangements – Statement and Conclusions – Letter and alpha numeric series – Venn Diagram – Logical Puzzles – Coding and Decoding

MODULE III MANAGEMENT SKILLS 7

Goal setting - Leadership styles – Team Building – Teamwork – Time Management – Stress Management

MODULE IV INTERVIEW SKILLS 8

Interview Preparation – CV's and Resume building - Preparation of Self Introduction- Facing Personal Interview – Mock interview

P - 30; TOTAL HOURS – 30

REFERENCES:

1. Tyra .M, Magical Book on Quicker Maths, BSC Publishing Company Pvt. Limited, 2009.
2. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Limited, 2017.
3. R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Limited, 2010.
4. Khattar Dinesh, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 3e, Pearson India, 2016.
5. Rajesh Verma, Fast Track Objective Arithmetic Paperback, Arihant Publications (India) Limited, 2018.

6. Arun Sharma Teach Yourself Quantitative Aptitude Useful for All Competitive Examinations, McGraw Hill Education (India) Pvt. Limited, 2019.
7. Bhattacharya. Indrajit, An Approach to Communication Skills, Dhanpat Rai & Co., (Pvt.) Ltd. New Delhi, 2008.
8. Swan, Michael, Practical English Usage, Oxford University Press, 2005.
9. P.A. Anand, Wiley's Quantitative Aptitude, 1st Edition, Wiley, 2015.
10. InduSijwali, A New Approach to Reasoning Verbal & Non-Verbal, Arihant Publications India limited, 2018.
11. Disha Experts, Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams 2nd Edition, Disha Publication, 2018.
12. Jaikishan, Premkishan, How to Crack Test of Reasoning, Arihant Publications India limited, 2018.

COURSE OUTCOMES:

CO1: Apply and solve the difficult problems of logical reasoning

CO2: Solve aptitude problems efficiently

CO3: Become a Leader or an effective team member and manage time and stress effectively

CO4: Face the Personality Test / Interview with confidence

Board of Studies (BoS):

13thBoS of Department of English
held on 17.6.2021

Academic Council:

17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10
CO1							L		M	
CO2					H					
CO3								L		
CO4								H		

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

This course helps to learn the skills such as active listening, collaboration, presenting ideas, effective communication and employability skills which are highly valued in the modern workplace.

SEMESTER V

CAD3101	LOGICAL REASONING AND THINKING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the concepts of Reasoning and thinking

COB2: Learn to take the right decisions, approach every problem with diligence and perform action accordingly.

COB3: Understand various mathematical approaches to solve problems.

COB4: Apply the concepts learned to solve critical problems.

COB5: Learn the various methods of data presentations.

MODULE I VERBAL ABILITY 9

Synonyms – Antonyms - Spotting Errors - Ordering of Words – Selecting Words - Ordering of Sentences – Sentence Correction - Closet Test – Reading Comprehension – One Word Substitutes - Idioms and Phrases – Change of Voice – Change of Speech.

MODULE II BASIC QUANTITATIVE APTITUDE 9

Speed, Time and Distance - Time and Work - Linear Equations - Progressions (Sequences & Series) - Permutation and Combination – Probability – Functions - Set Theory - Number Systems - LCM and HCF – Percentages - Collection and Scrutiny of Data: Primary data - Questionnaire and Schedule - Secondary Data.

MODULE III LOGICAL REASONING 9

Number and Letter Series – Calendars – Clocks – Cubes - Venn Diagrams - Binary Logic - Seating Arrangement - Logical Sequence - Logical Matching - Logical Connectives – Syllogism - Blood Relations - Concept of a statistical population and sample from a population: Qualitative and Quantitative Data.

MODULE IV MEASURES OF CENTRAL TENDENCY 9

Objective of averaging - Characteristics of Good Average - Types of Average, Arithmetic Mean of Grouped and Ungrouped data - Correcting Incorrect Values

- Weighted Arithmetic Mean - Median - Median of Grouped and Ungrouped Data
Merit and Limitation of Median - Computation of Quartile, Decile and Percentile-
Mode - Calculation of Mode of Grouped and Ungrouped Data - Merits and
Limitation of Mode, Relationship between Mean, Median and Mode - Geometric
Mean and Harmonic Mean.

MODULE V PRESENTATION OF DATA 9

Construction of Tables with one or more Factors of Classification -
Diagrammatic and Graphical Representation of Non-frequency data -
Frequency Distribution - Cumulative Frequency Distribution and their Graphical
Representation – Histogram - Column Graphs - Bar Graphs - Line Charts - Pie
Chart - Data Interpretation.

TOTAL HOURS:- 45

TEXT BOOKS:

1. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams,
Quantitative Methods for Business, Prentice-Hall,
WestPublishingCompany,1996.
2. R. S. Aggarwal, Quantitative Aptitude For Competitive Examinations,
2022 Exam By Bansal Book Depot.

REFERENCES:

1. Bajpai, N. Business Statistics, Pearson, 2010
2. Sharma J.K., Business Statistics, Pearson Education India, 2010.

COURSE OUTCOMES:

CO1: Capable to express their ideas using pleasing words in a clearly
understandable manner.

CO2: Efficient in making decision on quantitative Management problems.

CO3: Solve the problems using logical reasoning methods.

CO4: Analyze the observed data to solve the problems or make decision
sensible.

CO5: Categorize the data and present it in an attractive and self-explanatory
way.

Note: L - Low Correlation M – Medium Correlation H - High Correlation

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1				M						H		L		
CO2	H	H	M											
CO3	H	H	M											
CO4	H	H	M		L		M				L	L		
CO5				M						H	L	L		

Board of Studies (BoS) :

19th BoS was held on 13.2.2023

Academic Council

20th meeting of AC held on

13.4.23.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Reasoning and Thinking Course helps to develop the critical thinking of a student. Analyzing a problem on the bases of logical and mathematical methods help the student to make right decision and develop good programming logic.

CAD3108	FULL STACK TECHNOLOGIES	L	T	P	C
SDG: 9		3	0	2	4

COURSE OBJECTIVES:

COB1: Understand the concept of front-end and back-end technologies in web applications development.

COB2: Familiarize HTML, CSS, Javascript, React JS and Angular JS in front-end.

COB3: Demonstrate Node.JS, Express and MongoDB in back-end.

COB4: Analyze MEAN stack used in web applications..

COB5: Execute a real-world web and mobile applications.

MODULE I FULL STACK DEVELOPMENT 9

Introduction – The Rise of Full-stack JavaScript - Pros and Cons – Popular stacks – Frond-end and Back-end Languages, Frameworks and Libraries – Text editors – HTML: Basic Tags – Forms – Images – Audios and Videos – CSS: Selectors – Box Model – JavaScript: Functions – Objects – Arrays – Events – DOM – JSON – AJAX – jQuery.

MODULE II CLIENT SIDE SCRIPTING: ANGULARJS 9

Overview – Single-page Applications - Model-View-Controller Architecture – Modules – Data Binding – Directives – Dependency injection – Expressions – Controllers – Model – Filters – Form Validation – Client-side Routing.

MODULE III CLIENT SIDE SCRIPTING: REACTJS 9

Introduction – Benefits – Disadvantages – JSX – React Components – React State – Components life cycle events – Rendering components – Handling Events – React Forms – React Router – React Redux – React Hooks.

MODULE IV SERVER SIDE SCRIPTING: NODEJS AND EXPRESS 9

Node.JS: Introduction – Installing Node.js – REPL – NPM – Modules – Event Loop – Asynchronous Coding – Callback Functions – Event Emitters – Core modules: Buffer, Stream, File system – Building the Node Server. – Express: Introduction – Installing Express – Creating Express Application – Application, Requests and Response objects – External Middleware – Implementing a MVC Pattern – Configuring an Express application – Implementing Express in Node.js

MODULE V NOSQL AND APPLICATIONS DEPLOYMENT 9

MongoDB: Introduction to NoSQL and MongoDB – Key features – MongoDB

Shell – MongoDB databases – Collections - CRUD operations – Schema Initialization – Reading from MongoDB – Writing to MongoDB – Introduction to Mongoose – Deployment: Tools – Running Node.js Application in AWS and Heroku – MongoDB on Heroku

LIST OF PROGRAMS:

1. Create a simple webpage using HTML basic tags.
2. Create a registration form using HTML.
3. Create a simple webpage using HTML and different types of CSS.
4. create a simple webpage using HTML and CSS box model
5. Create a registration form and validate the contents using JavaScript.
6. Create a simple calculator using React JS
7. Create a counter using React JS.
8. Create a Simple Login form using Angular JS
9. Develop an Angular JS Single Page Application.
10. Create a Node JS server without using Express.
11. Create a Node JS server using Express.
12. Create a simple Login page with validation using React JS/Angular JS, Node JS and Mango DB.
13. Create a Todo application using ReactJS/AngularJS and NodeJS.

L – 45; P- 30; Total Hours – 75

TEXT BOOKS:

1. Vasan Subramanian, “Pro MERN Stack Full Stack Web App Development with Mongo, Express, React, and Node”, Second Edition, Apress, 2019.
2. Amos Q. Haviv, “MEAN Web Development”, Second Edition, Packt Publishing, 2016.

REFERENCES

1. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications”, 2nd Edition, Addison-Wesley Professional, 2018.
2. AzatMardan, “React Quickly: Painless web apps with React, JSX, Redux, and GraphQL” Manning Publications, 2017
3. ShamaHoque, “Full-Stack React Projects Full-Stack React Projects”,

Second Edition, Packt Publishing, 2020.

- Adam Bretz and Colin J. Ihrig "Full Stack JavaScript Development with MEAN" SitePoint Pty. Ltd, 2014.

COURSE OUTCOMES:

CO1: Develop client side application using HTML5, CSS, JavaScript.

CO2: Design interactive and responsive web page with ReactJS and AngularJS.

CO3: Create a server side application using NodeJS.

CO4: Administer and manipulate MongoDB databases using Node.js

CO5: Construct and deploy single page application using MEAN stack.

Board of Studies (BoS)

19th BoS was held on
13.2.2023

Academic Council

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H		H		H	H					H		H	
CO2		H	H		H	H					H			
CO3		H				H								
CO4	M		H	M		H				M				
CO5						H			H			H	H	H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9:

Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

Full stack developer course covers Front end and back end tools technology. This course will motivate the student to develop real time interactive web and mobile applications independently.

SEMESTER VI

CAD 3201	ENTERPRISE APPLICATION	L	T	P	C
SDG: 9	DEVELOPMENT	3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the different types of enterprise applications.

COB2: Familiarize the dynamic web application using servlets.

COB3: Learn nodejs for backend scripting.

COB4: Integrate frontend reactjs Scripting with backend.

COB5: Develop the industrial application.

MODULE I INTRODUCTION TO ENTERPRISE APPLICATION 9

Enterprise Architecture - Life Cycle, Development Framework, architectural model- Conceptual Layers, Enterprise IT architecture domain, Enterprise Resource Planning (ERP)-Customer Relationship management (CRM)-Supply Chain Management (SCM) and HRM; Enterprise Java- Introduction to web application and its life cycle.

MODULE II DYNAMIC WEB PAGES AND JAVA SERVLETS 9

Overview of HTML5 - CSS- Servlets- Introduction; Servlet Lifecycle; sessions; session tracking using hidden fields, user authentication, URL rewriting and cookies; Inter servlet Communication; Java Server Pages (JSP) - Introduction to JSP tags; JSP life cycle; Directives; Custom JSP tags; Java Server Faces technology - Introduction to page navigation; tags, life cycle and architecture.

MODULE III NODE JS 9

NodeJS module system - File system and command line args – Debugging nodeJS – Asynchronous NodeJS – Webservers – Accessing API from browsers – Application Deployment.

MODULE IV REACT JS 9

Getting Ahead in React - Node Package Manager - React Function Components and TypeScript - Setting Up an Enterprise-Level App - Building a Dashboard

MODULE V APPLICATION DEVELOPMENT 9

Dashboard creation for data science projects - Capstone projects.

TOTAL HOURS –45**TEXT BOOKS:**

1. Practical Enterprise React – Springer, 2021.
2. O’Reilly – Java Enterprise Best Practices,2003.
3. A practical Guide to Enterprise Architecture by James McGovern,2003

REFERENCES:

1. Java Server Faces: The complete Reference by Chris Schalk, Ed Burn sand James Holmes, 2006.
2. Head First Serve lets and JSP by Bryan Basham, Kathy Sierra and Bert Bates fromO’ReillyMedia,INC,2008

COURSE OUTCOMES:

CO1:Identify the uniqueness of different enterprise application.

CO2: Design dynamic webpage with java servlets.

CO3:Provide database connectivity using nodejs scripting.

CO4:Perform client side scripting using reactjs.

CO5:Create dynamic enterprise applications.

Board of Studies (BoS)

19th BoS was held on 13.2.23

Academic Council

**20th Meeting of AC held on
13.4.23**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1		M				L								
CO2				L					L					
CO3								M						
CO4	L		H		M									
CO5		M			M	H	H			H	M	H	H	

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: By the learning of enterprise application development, the students can able to develop the enterprise application and implement real time applications.

CAD 3202	PROJECT WORK	L	T	P	C
SDG: 9		0	0	0	12

COURSE OBJECTIVES:

COB1: To explore the awareness of team work among the students

COB2: To investigate the current industry-related issues.

COB3: To provide knowledge on various algorithms and techniques

COB4: To learn about the various testing methods to interpret the results

COB5: To inculcate good report-writing and presenting abilities

PROCEDURE:

The students are allowed to do their project as an individual or as a team of two students. A committee of faculty members constituted by the Head of the Department will carry out three periodic reviews. The project committee members include the project coordinator along with two or three expert faculty members from the department. Based on the project report submitted by the student, an oral examination (viva voce) shall be conducted as semester end examination by an external examiner approved by Controller of Examinations.

Evaluation of the Project

The project work is a continuous evaluation procedure where it is assessed for the maximum of 100 marks including internal and external assessment.

PROJECT EVALUATION CRITERIA

S.No	Description	% Marks Allotted
1	Internal Assessment	50
2	External Assessment	50
	Total	100

Project evaluation Split-up

- Internal assessment (50%)
 - (i) Periodic reviews 50%
- External assessment (50%)
 - I. Evaluation of Project Report by the external Examiner 10%
 - II. Evaluation of Project Report by the internal Examiner 10%
 - III. Viva-Voce Examination 30%

INTERNAL ASSESSMENT SPLIT UP

S.No	Review Description	Marks Allotted
1	Zeroth Review	15
2	First Review	20
3	Second Review	20
4	Third Review	20
5	Internal Guide	10
6	Final Project Report	15
	Total	100

EXTERNAL ASSESSMENT SPLITUP

S.No	Review Description	Marks Allotted
1.	Internal Examiner Project Report Evaluation	20
2.	External Examiner Project Report Evaluation	20
3.	Innovation	10
4.	Tool Usage	10
5.	Presentation	10
6.	Viva-Voce	10
7.	Implementation and Demo	20
	Total	100

COURSE OUTCOMES:

CO1: Co-ordinate with team members and communicate effectively.

CO2: Examine the problem using the information and constraints and plan the implementation for given problem satisfying the functional requirements.

CO3: Solve the current industry-related issues using appropriate techniques and tools.

CO4: Apply various software testing tools.

CO5: Demonstrate the working project and prepare project reports in the recommended format.

Board of Studies (BoS)19th BoS was held on 13.2.23**Academic Council**20th Meeting of AC held on
13.4.23

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	H	H	H	M	M	M	M	H	H	L	H	H	H	H
CO2	H	H	H	M	M	M	L	H	H	L	H	H	H	H
CO3	H	H	H	M	M	M	M	H	H	L	H	H	H	H
CO4	M	M	M	M	M	M	M	M	H	H	M	H	H	H
CO5	M	M	M	M	M	M	M	H	H	H	H	M	H	H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Student doing projects in multiple domains will promote industrialization and foster innovation.

TECHNOLOGY CORE COURSE (SEMESTER III)

CADX 101	INTRODUCTION TO CLOUD	L	T	P	C
SDG: 9	TECHNOLOGY	3	0	0	3

COURSE OBJECTIVES:

COB1: Introduce the basic concept and importance of cloud computing.

COB2: Explore the architecture of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud etc.

COB3: Compare and evaluate the virtualization techniques.

COB4: Describe about resource management and its related issues.

COB5: Provide knowledge about cloud providers and applications.

MODULE I INTRODUCTION TO CLOUD COMPUTING 9

Overview of Cloud Computing - History and Evolution of Cloud Computing
 - Purpose of Cloud Computing - Characteristics of Cloud - Types of clouds
 - Private, Public and hybrid cloud - Merits and Demerits of cloud -
 Challenges of cloud - Major components of Cloud Computing - Emerging
 cloud technologies.

MODULE II CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

Introduction to cloud architecture - Layered Cloud Architecture Design -
 NIST Cloud Computing Reference Architecture - Overview of Cloud
 services - IaaS - PaaS - SaaS - Architectural Design Challenges -
 Architecture of a cloud computing ecosystem - Cloud migration checklist-
 Cloud Storage - Storage-as-a-Service - Advantages of Cloud Storage.

MODULE III VIRTUALIZATION TECHNIQUES IN CLOUD COMPUTING 9

Overview of Virtualization - Need of Virtualization - Types of
 Virtualizations- Benefit of Virtualization - Comparison of traditional IT
 infrastructure with virtualized infrastructure - Customer IT landscape,
 function of data center, trigger for virtualization, preparation for
 virtualization, server selection, server sizing, server criticality,
 provisioning, proximity and locality, transition tool for virtualization.

MODULE IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management - Resource Provisioning and Resource Provisioning Methods - Global Exchange of Cloud Resources - Cloud Security Overview - Cloud Security Challenges - Data Privacy and Security Issues - Software-as-a-Service Security - Security Governance - Security Standards - Virtual Machine Security.

MODULE V CLOUD PROVIDERS AND APPLICATIONS 9

Overview of Cloud providers - Google App Engine, Microsoft Azure, Amazon Web Services (AWS), Salesforce and IBM - Creation of AWS account and EC2 instance in cloud - Application of Cloud computing technologies - Hybrid cloud and multicloud, Test and Development, Big Data Analytics and Disaster recovery.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. AnandNayyar, "Handbook of Cloud Computing", BPB Publication, First Edition 2019 India.
<https://www.scribd.com/read/424451914/Handbook-of-Cloud-Computing>
2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.
3. Ricardo Puttini, Thomas Erl, and Zaigham Mahmood, "Cloud Computing: Concepts, Technology & Architecture", PHI, 2013.
4. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, John Wiley and Sons Publications, "Cloud Computing: Principles and Paradigms", 2011.
5. Introduction to Virtualization and Cloud Computing (IBM ICE Publication).
<https://sites.google.com/site/sajalsahaofficial/ibm1309-introduction-to-virtualization-and-cloud-computing-lab-1>

REFERENCES:

1. Buyya, Vecchiola and Selvi, "Mastering Cloud Computing", Tata McGraw Hill Education. ISBN, 9332900949. 2013.
2. Christopher Barnett, Constable & Robinson Limited, "Brief Guide to Cloud Computing", 2010.
3. Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, Matias Woloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform", [ISBN: 9780735656062].
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media;

1 edition [ISBN: 0071626948], 2009.

COURSE OUTCOMES:

Students will be able to

CO1: know the essential principles, technology, Merits and Demerits of cloud computing.

CO2: develop ability to comprehend and apply cloud computing and storage architecture, as well as service.

CO3: learn the key concept of virtualization technologies that help in the development of cloud.

CO4: develop ability to address cloud computing key challenges, such as resource management and security.

CO5: learn about the cloud providers and its applications.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H											M		
CO2			H		H									H	
CO3			H		H				H					H	
CO4				H					H				M		
CO5			H												

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Introduction to Cloud Technology helps the learners to preparing a plan for moving to and technologies utilized by cloud computing and they can also analysis of case studies and legal issues when deciding to adopt cloud computing architecture. Furthermore, knows the solutions for management of cloud services and demonstrate cloud based application.

CADX 103	INTRODUCTION TO DATA SCIENCE	L	T	P	C
SDG:9		3	0	0	3

COURSE OBJECTIVES:

COB1: Overview of the interdisciplinary concepts of data science in the real time applications.

COB2: Basic statistical and mathematical foundations for data science.

COB3: Demonstrate proficiency with the methods and techniques for obtaining, organizing, exploring and analyzing the data.

COB4: To understand the role of machine learning techniques.

COB5: Learn how to handle the large volume of data.

MODULE I INTRODUCTION TO DATA SCIENCE 9

Overview of Data Science and Its Importance - History and development of Data Science – Basic frame work and architecture – Evolution of DataScience– DataScience Roles-Primary components of Data Science - Users of Data Science and its Hierarchy Model.

MODULE II DATACOLLECTION AND PRE-PROCESSING 9

Introduction to Data Collection – types of Data - Resources of Data - Data Collection Strategies -Overview of Data Pre-Processing – Data Cleaning – Data Integration and Transformation – DataReduction–DataDiscretization.

MODULE III STATISTICAL MODELLING 9

Overview of Statistical Modelling for DS - Important statistical concepts used in data science -Types of statistical measures - Predictive and prescriptive statistics - Statistical inference and itsusage-Normal distribution, Testhypotheses, Central limit theoremand Confidence interval.

MODULE IV MACHINE LEARNING TECHNIQUE IN DATASCIENCE 9

Basic concept of Machine Learning Technique – Supervised Learning - Unsupervised Learning –Overview of Regression Technique - Linear Regression – Overview of Classification Technique: Linear Classification Model,Overview of ClusteringTechnique –K-Means Clustering.

MODULE V SOFTWARE TOOLS AND APPLICATIONS

Overview of software applications- R/Python/Tableau - Important proprietary and open-sources software tools –different business intelligence tools and its crucial role in DataScience–Applications– Healthcare, Business and Education Sectors.

L – 45 ; Total Hours - 45**TEXTBOOKS:**

1. Data Smart: Using Data Science to Transform Information into Insight 1st Edition by John W. Foreman. (2015) Wiley Publication.
2. Data Science from Scratch: First Principles with Python 1st Edition by Joel Grus.
3. Igual, Laura, and Santi Seguí. "Introduction to data science." In Introduction to Data Science, pp. 1-4. Springer, Cham, 2017.

REFERENCEBOOKS:

1. Data Science for Dummies by Lillian Pierson (2015)
2. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking by Foster Provost, Tom Fawcett.

COURSE OUTCOMES:

After completing this course, students will be able to

CO1: Distinguish between data science terminologies and business analytics.

CO2: Develop mathematical and statistical models for data science applications.

CO3: Apply appropriate machine learning technique for the analysis.

CO4: Select appropriate software tools.

CO5: Gain knowledge about real world applications of data science.

Board of Studies (BoS) :

16th BoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H		M		M								M	
CO2		L	M		M									L
CO3			L		H						L		M	M
CO4		L	M		H								H	
CO5	H				M									H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG9: Industry, Innovation and Infrastructure—Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The learner will be able to develop a mechanism for realtime problems.

CADX104	MULTIMEDIA TOOLS AND TECHNIQUES	L T P C
SDG:9		3 0 0 3

COURSE OBJECTIVES :

COB1: Understand Multimedia basics, its working environment and terminologies.

COB2: Learn the flash/ animate supports.

COB3: Understanding vector and raster graphics for image handling.

COB4: Import and use sound effects in animation programs.

COB5: Design and create animation using computerized animation tools.

MODULE I INTRODUCTION TO MULTIMEDIA

Overview of Multimedia -Types of Multimedia –Making Multimedia- Application of Multimedia-The stages of a Project –Pre-requisites – Multimedia Skills and Training-Fundamental of 2D Modeling- Text Editing and Word Processing, Painting and Drawing, 3 D Modeling and Animation, Image Editing, Sound Editing, Video and Digital Movies, animation supports.

MODULE II MULTIMEDIA FILE HANDLING

Overview of Multimedia file handling - Compression and decompression – Multimedia I/O technologies - Data and file format standards - GIF -JPEG - Color Palette –Color models-Layers -Creating new raster images - Brushes – Grids and Gradients -Scaling raster images -Moving and Merging Layers - Tool Palette -Dialogs -masking –Filters –Adding text to images –Designing icons and background images.

MODULE III IMAGE HANDLING

Overview of multimedia image handling –basics of symbols and libraries - Creating Simple Vector graphics –Creating banners -Images –Working with layers –Tweening -Motion guide –Masking –Frame by Frame animation – Onion Skin Effect –Creating special effects -Text effects and animation.

MODULE IV ANIMATION AND INTERACTION

Creating clippings - Animations with sound effects -Adding audio or Video – Windows Media Player ActiveX Control -Real Player ActiveX control- web

site theme components – Motion Graphics -Animations and Interaction –
case study: web based 3D animation.

MODULE V

MOBILE MULTIMEDIA AND PROJECT PLANNING

Multimedia for Mobile devices – Multimedia Content representation technologies - Multimedia content for mobile entertainment – Multimedia over wireless mobile data networks. Estimating -Designing - Producing - Content and Talent- Acquiring Content – Using content created by others - Using Content created for a Project - Using Talent Delivering: Testing - Preparing for Delivery - Compact Disc Technology - Wrapping It.

L– 45 ; Total Hours - 45

TEXT BOOKS:

1. Richard Schrand, Photoshop 6 Visual Jumpstart, AdobePress2000.(II)
2. James L. Mohles, Flash 5.0 Graphics, Animation & Interaction,
3. Syed Mahbubur Rahman “Multimedia Technologies: Concepts, Methodologies, Tools, and Applications”

REFERENCES :

1. TayVaughan, "Multimedia: Making It Work,8th Edition", McGrawHill,2010.
2. John F Koegelbuford, Multimedia Systems Addison Wesley - First IndianReprint, 2000.

COURSE OUTCOMES :

Students who complete this course will be able to

CO1: identify the basic components, basic hardware and software requirements for multimedia development and playback.

CO2: identify and describe the function of the general skill sets in multimedia.

CO3: apply animation principles in multimedia application development.

CO4: edit images in Photoshop.

CO5: implement animated concepts in multimedia projects.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	M		M		H								H	
CO2		L	M		L									M
CO3			L		M						L		H	M
CO4		L	M		H								M	
CO5	H				M									M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The learner will be able create and design multimedia with appropriate tools and techniques.

CADX 122	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

SDG: 4**COURSE OBJECTIVES:**

COB1: Understand the basics of Artificial Intelligence and about intelligent agents.

COB2: Learn to apply problem solving strategies to common AI applications.

COB3: Familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation.

COB4: Know the AI agents and explore the AI tools & Libraries.

COB5: Study the AI based applications & its features.

MODULE I INTRODUCTION 9

Introduction– Agents Environment – Future of Artificial Intelligence – Properties of Search Algorithm – Types of Search Algorithm - Characteristics of Intelligent Agents– Typical Intelligent Agents.

MODULE II SEARCH METHODS AND TECHNIQUES 9

Problem solving Methods – Uninformed: Breadth First Search – Depth First Search – Depth Limited Search – Uniform Cost Search Algorithm – Bidirectional Search Algorithm – Informed: Greedy Search – A star – AO Star - Heuristics - Constraint Propagation – Backtracking Search.

MODULE III KNOWLEDGE BASED AGENTS 9

Propositional Logic – Wumpus World Problem - First Order Logic – Atomic Logic – Quantifiers in AI – Inference – Unification Algorithms - Forward Chaining - Backward Chaining – Resolution – AI Techniques – Game Playing.

MODULE IV SOFTWARE AGENTS & TOOLS 9

Architecture for Intelligent Agents – Agent communication – Natural Language Processing - Expert Systems – Inductive Learning – Decision Tree Learning -Scikit Learn – Numpy – SciPy Libraries – Tensorflow – AI foundation- Installation – Visualization – Regression – Theano & Keras – Exploration of basics.

MODULE V APPLICATIONS 9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Robot – Hardware – Perception – Planning – Moving and characters -Word embedding's – Speech Recognition.

TOTAL HOURS – 45**TEXT BOOKS:**

1. Daugherty, Paul R., and H. James Wilson. "Human+ machine: reimagining work in the age of AI", Harvard Business Press, 2018.
2. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.

REFERENCES:

1. I. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
2. Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013.
3. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
4. Kaplan, Jerry."Artificial intelligence: What everyone needs to know", Oxford University Press, 2016.
5. Ivan Bratko : "Prolog Programming For Artificial Intelligence" , 2nd Edition Addison Wesley.

COURSE OUTCOMES:

CO1: Deploy the basics of AI and AI agents in real-time scenario.

CO2: Practice and analyze the various problem solving methods in AI.

CO3: Apply the knowledge representation techniques to study and solve the problem.

CO4: Use the insights of AI agents and AI tools to evaluate the problem.

CO5: Study and implement the various applications of AI.

Board of Studies (BoS):

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			M										H	
CO2					H								H	
CO3				H	M								M	
CO4			M						H				H	
CO5									M		M		H	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4:

Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:

The Basics of AI were taught in this course. Understanding the insights and importance of AI will motivate the student to deploy the AI based business applications in real-time scenario. The knowledge attained through AI will improve the skills set of the student to meet industrial demand in AI domain.

CADX128	INTRODUCTION TO CYBER	L	T	P	C
SDG: 9	SECURITY	3	0	0	3

COURSE OBJECTIVES:

COB1:To understand the fundamentals of Computer and Cyber security

COB2:To study about various security threats and securing systems.

COB3:To learn the need for Data protection.

COB4:To know about the significance of tools used for security.

COB5:To implement methods and tools to protect from strive attacks

MODULE I INTRODUCTION 9

Overview of Computer and Web technology- Architecture of cyberspace- Communication and web technology- Internet- World wide web- Authentication Systems-Remote access Monitoring- Concept of cyber security- Issues and challenges of Cyber Security

MODULE II SYSTEM SECURITY 9

Inner Perimeter Protection: Operating Systems-Security Choices - Operating System Security Tools - Local Administrative Tools - Data Encryption Implementation-Setting and configuring two factor authentication in the Mobile phone -Protect Remote Access:Secure Connection- Establish and Use a Firewall- Install and Use Anti-Malware Software- Unnecessary Software Removal- Disable Nonessential Services.

MODULE III DATA PROTECTION 9

Secure the Web Browser- Configure Browser Security Options- Introduction to Social media networks- Socialmedia privacy- Challenges- Opportunities and pitfalls in online social network- Security issues related to social media- Flagging and reporting of inappropriate content- Laws regarding posting of inappropriate content-Best practices for the use of Social media softwares

MODULE IV TOOLS 9

Usage of Basic Tools :IFconfig/Ipconfig- Whois- Nslookup- PING- Traceroute- Telnet-SecureShell.MonitoringTools:Nagios-SolarWinds-Microsoft Network Monitor-Wireshark- Honeypot- John ripper-Qubes-Tails.

MODULE V CASE STUDY 9

Zero Day Vulnerabilities-Software Exploits-Social Engineering Exploits- Network Threats and Attacks- Dictionary Attacks- Denial of Service (DoS) Attacks- Spam- Redressal mechanism for violations and misuse of Social media platforms.

L – ; TOTAL HOURS –45

TEXT BOOKS:

1. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short., "Cybersecurity Essentials", John Wiley & Sons, Indiana, 2018.
2. Stuart McClure, Joel Scambray, George Kurtz "Hacking Exposed 7: Network Security Secrets & Solutions", Seventh Edition, McGraw Hill Professional 2012.

REFERENCES:

1. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, 2011.
2. Ankit Fadia —"Ethical Hacking", second edition, Macmillan India Ltd, 2006.

COURSE OUTCOMES:

CO1:Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure

CO2:Design, develop, test and evaluate secure software

CO3:Develop policies and procedures to manage enterprise security risks.

CO4:Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

CO5:Interpret and forensically investigate security incidents.

Board of Studies (BoS) :

17th BOS was held on 01.06.2022

Academic Council:

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			L											
CO2			M		H									
CO3				H	M									
CO4		H												H
CO5	L					M								H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Cyber security is one of the most important aspects of the fast-paced growing digital world. The threats of it are hard to deny, so it is crucial to learn how to defend these attacks and teach others how to do it too.

TECHNOLOGY CORE COURSE (SEMESTER IV)

CADX 201	INFORMATION SECURITY FUNDAMENTALS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the fundamentals of security its components and life cycle.

COB2: Analyze the need for security in Business and IT.

COB3: Classify the security measures for network infrastructure.

COB4: Assess the risk and security metrics and plan for risk management.

COB5: Understand the need of Performing Asset Classification and Declassification, Retention and Disposal of Information Asset.

MODULE I INTRODUCTION TO INFORMATION SECURITY 9

Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System; Balancing Information Security and Access; Implementing IT Security, The system Development Life cycle, Security professional in the organization.

MODULE II THE NEED FOR IT SECURITY 9

Business Needs-Protecting the functionality, Enabling the safe operations, Protecting the data, safe guarding the technology assets; Threats-compromises to Intellectual property, deliberate software attacks, Espionage and trespass, sabotage and vandalism; Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering.

MODULE III NETWORK INFRASTRUCTURE SECURITY AND CONNECTIVITY 9

Understanding Infrastructure Security- Device Based Security, Media-Based Security, Monitoring and Diagnosing; Monitoring Network- Firewall, Intrusion Detection System, Intrusion Prevention system; OS and Network Hardening, Application Hardening; Physical and Network Security- Policies, Standards and Guidelines.

MODULE IV IT RISK ANALYSIS, RISK MANAGEMENT AND SECURITY METRICS 9

Major steps of IT risk analysis - probability, impact, and prioritization. Approaches to managing security risks - reduction, mitigation transfer, and acceptance. Managing

risk with metrics. Identity Access Management, Security incident, response planning, Business Continuity Planning after a security incident.

MODULE V INFORMATION ASSET CLASSIFICATION AND RECENT CHALLENGES 9

Classification of Information, Information Assets, Declassification, Retention and Disposal of Information Assets. Recent challenges in - cyber security, internet security. Case studies on – Ransomware, Data Breaches, Malware, Compromised Passwords.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Foundations of Information Security A Straightforward Introduction, No Starch Press (October 7, 2019), ISBN-10 : 1718500041
2. Cryptography and Network Security Principles and Practices, by William Stallings, Pearson Education; Seventh edition (30 June 2017)
3. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 6th edition (2017)
4. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
5. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerba, 2012.

REFERENCES:

1. Elementary Information Security, Jones & Bartlett Learning; 3rd edition (October 28, 2019)
2. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – by Deven N. Shah, Wiley.
3. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 2nd edition.

COURSE OUTCOMES:

CO1: Understand the fundamentals of security.

CO2: Interpret the need for IT security.

CO3: Apply the security measures in a network infrastructure.

CO4: Explore the risks involved in an IT environment.

CO5: Infer about information asset classification and real time case studies.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M						L		L					L	
CO2						H									
CO3	L						M	H					L		
CO4							H		M					L	
CO5									M				M		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Industry, Innovation & Infrastructure

Statement: The understanding of concepts related to risks and vulnerabilities in information security along with familiarization of various levels of security policies and authorization levels in a real time scenario.

CADX 202	BUSINESS INTELLIGENCE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the importance of decision making in business.

COB2: Learn how data can be retrieved from various sources and how data can be represented in various formats.

COB3: Learn Descriptive analytics using Microsoft Excel and its applications.

COB4: Introduce the concepts of predictive analytics using neural network.

COB5: To apply descriptive analytics and predictive analytics in the real world business problems.

MODULE I INTRODUCTION TO BUSINESS INTELLIGENCE 9

The Business Pressures-Responses-Support Model, Managerial Decision Making, Information Systems Support for Decision Making, A Framework for Business Intelligence (BI), Business Analytics Overview, Brief Introduction to Big Data Analytics, Decision Making: Introduction and Definitions, Phases of the Decision-Making Process, Business Ecosystem, stakeholders.

MODULE II DATA RETRIEVAL 9

Data Integration and the Extraction, Transformation, and Load (ETL) Processes, Business Reporting Definitions and Concepts, Different Types of Charts and Graphs, Business Performance Management.

MODULE III DESCRIPTIVE ANALYTICS USING MICROSOFT EXCEL 9

PivotTable fundamentals: Introduction of PivotTable, PivotTable customization – Different PivotTable layout – Renaming the fields – Formatting numbers – Summary calculations, Introduction to slicers.

MODULE IV PREDICTIVE ANALYTICS 9

Data Mining Concepts and Applications, Data Mining Applications, Data Mining Process, Data Mining Methods, Data Mining Software Tools, Data Mining Privacy Issues, Myths, and Blunders, Basic Concepts of Neural Networks.

MODULE V BUSINESS ANALYTICS 9

Decision Support Systems, Introduction to customer relationship management, Business analytics tools like excel, tableau, case study: Tesco CRM, Apple CRM, KFC CRM.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Business Intelligence and Analytics: Systems for decision Support, Ramesh Sharda, DursunDelen, Efraim turban, Tenth edition, Pearson, 2015.
2. Business Intelligence in Plain Language: A practical guide to Data Mining and Business Analytics by Jeremy Kolb,2016
3. Microsoft Business Intelligence Tools for Excel Analysts, Michael Alexander, Jared Decker, Bernard wehbe, Wiley, 2014.

REFERENCES:

1. Business Intelligence and Analytics, Drew Bentley, Library press, 2017
2. Business Intelligence Strategy – A practical Guide for Achieving BI Excellence, John Boyer, Bill Frank, Brian Green Tracy Harris and Kay Van De Vanter, First Edition, IBM Corporation, 2010.

COURSE OUTCOMES:

CO1: Design the Decision support system for the respective business eco systems.

CO2: Integrate data and can perform extraction, transformation and load process.

CO3: Perform descriptive analytics.

CO4: Provide predictive analytical solution.

CO5: Build recommender system and customer relationship model in various business case studies.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1							L					M	L	
CO2						M				H				M
CO3	M		M											H
CO4				L				L				M	L	M
CO5		L			L									H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The learner will be able to detect patterns through vast amounts of historical data much more quickly and accurately and can take better decision to the future Industrial and infrastructural projects.

CADX 203	INTRODUCTION TO SCRIPTING	L	T	P	C
SDG: 9	LANGUAGES	3	0	0	3

COURSE OBJECTIVES:

COB1: Learn about various scripting languages

COB2: Know how the various scripting languages work

COB3: Familiarize how VB Script and Java Script works

COB4: To understand how error occurs and how to handle the errors

MODULE I INTRODUCTION TO VB SCRIPT 9

Introduction – Adding VBScript Code to an HTML Page – VB Script Basics – VBScript Data Types – VBScript Variables – VBScript Constants – VBScript Operators – Using Conditional Statements – Looping Through Code – VBScript Procedures – type casting variables – math functions –date functions – string functions – VBScript Coding Conventions – Dictionary Object in VBScript – Err Object.

MODULE II INTRODUCTION TO JAVASCRIPT 9

Introduction – Advantages of JavaScript – JavaScript syntax – Data types and Literal –Variables– Array – Operators& Expressions – Conditional Checking – Looping – Functions – Built In Functions – User Defined Functions – Dialog Boxes.

MODULE III JAVASCRIPT DOCUMENT OBJECT MODEL 9

Introduction – Object in HTML – Browser objects – Navigator object – Window object – Document object – Location Object –History Object – Screen Object – Event Handling —Form object – Other Build–in Objects – String Object, Math Object and Date Object – User defined Objects – Cookies.

MODULE IV ASP.NET BASICS 9

Language Structure – Page Structure – Page event, Properties, Compiler Directives. HTML server controls – Anchor, Tables, Forms, Input File control. Basic Web server Controls – Label, Text box, Button, Link Button, Image Button, Check Box, Radio Button, Hyperlink, Image Control. Data List Web Server Controls – Check Box List. Radio Button List, Drop Down List, List box, Data Grid, Repeater control.Other Web Server Controls – Calendar Control, Validation Controls.

MODULE V CLASSES, WORKING WITH DATA AND 9 ADVANCED ISSUES

Classes – Request Objects, Response Objects, Cookies. Working with Data – OLEDB Connection Class, Command Class, Transaction Class, and Data Adaptor Class, Data Set Class. Advanced Issues – E-mail, Application Issues, Working with IIS and Page Directives, Error Handling, Security – Authentication Control, IP Address Restrictions, Secure Communications by SSL and Client Certificates.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Bayross, 2000, Web Enable Commercial Application Development Using HTML, DHTML, Javascript, Perl CGI, BPB Publications.
2. Greg Buczek, ASP.NET: Developer's Guide, TMH, 2002.

REFERENCES:

1. HathleenKalata, Internet Programming with VB Script and JavaScript, Thomson Learning
2. T.A. Powell, 2002, Complete Reference HTML , TMH.
3. J.Jaworski, 1999, Mastering Javascript, BPB Publications.
4. Powell, Thomas; Schneider, Fritz, JavaScript: The Complete Reference, 2nd edition 2004, TMH

COURSE OUTCOMES:

CO1: Implement basic JavaScript programs with simple and composite data types.

CO2: Write simple JavaScript code to automate system administration tasks and rapidly

CO3: Develop simple applications using object models and event handling mechanisms.

CO4: Design Client side validation using JavaScript.

CO5: Identify the errors and apply suitable error handling methods.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1					L										
CO2															
CO3		H						M							
CO4															
CO5										H					

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The course outcomes are measurable and enable the learner to apply the concepts of scripting languages learned in this course will be able to design and develop a dynamic web application for the industry.

CADX 219	INTRODUCTION TO MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

SDG: 4

COURSE OBJECTIVES:

COB1: Understand the basics of machine learning techniques.

COB2: Learn to perform prediction analysis using python.

COB3: Familiar with basic principles of classification techniques used in supervised learning.

COB4: Know the unsupervised and reinforcement learning techniques

COB5: Study the ML based applications & its features.

MODULE I FUNDAMENTALS OF ML 9

Basics of Machine Learning – Supervised Learning - Regression – Classification
- Unsupervised Learning – Clustering – Association – Semi-Supervised Learning
- Reinforcement Learning – Controls

MODULE II REGRESSION 9

Data Preprocessing - Regression: Simple Linear Regression - Multiple Linear
Regression, Polynomial Regression - Support Vector Regression - Decision
Tree Regression - Random Forest Regression.

MODULE III CLASSIFICATION 9

Classification : Logistic – K-Nearest Neighbors (KNN) – Support Vector Machine
– Kernel SVM – Naïve Bayes – Decision Tree Classification – Random Forest
Classification

MODULE IV UNSUPERVISED LEARNING 9

Clustering – K-Means Clustering - Hierarchical Clustering – Reinforcement
Learning – Upper Confidence Bound – Thompson Sampling.

MODULE V CASE STUDIES 9

Prediction to invest in Startups – Social Network Ads – Forecasting – Targeted
Marketing .

TOTAL HOURS – 45

TEXT BOOKS:

1. Andreas Muller, Introduction to Machine Learning With Python A Guide For Data Scientists, 2016.

2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, 2nd 2018. (ISBN: 9781337560092).

REFERENCES:

1. Miroslav Kubat, An Introduction to Machine Learning, Springer , Second Edition, 2017
2. Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press – 2014

COURSE OUTCOMES:

CO1: Understand a very broad collection of machine learning algorithms and problems.

CO2: Handle missing data, process and analyze the data using regression Algorithm.

CO3: Develop and analyze for various classification algorithms.

CO4: Implement Unsupervised and Reinforcement Learning Algorithms.

CO5: Apply structured techniques on unstructured real time data.

Board of Studies (BoS):

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1		M											H	
CO2					H								H	
CO3			H		M								M	
CO4				M					H				H	
CO5									M		M		H	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4:

Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:

This course covered the fundamentals of Machine Learning. By gaining an understanding of the key concepts and applications of ML, students will be motivated to implement ML-based solutions in real-world scenarios. The skills and knowledge acquired through this course will help students meet the demand for ML expertise in industry.

CADX 224	ETHICAL HACKING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the basics of Hacking and Information gathering

COB2: Secure from various hacking attacks and Wireless Vulnerability

COB3: Acquire knowledge on protecting data assets from web hacking

COB4: Evaluate the various performance of hacking tools.

COB5: Apply learned concept to solve various real time problems.

MODULE I INTRODUCTION 9

Fundamentals - Hacker types - Phases of hacking-Information gathering- Hacking windows –Web hacking – Password hacking.

MODULE II WINDOWS SECURITY AND WIRELESS NETWORKS 9

Hacking windows-Unauthenticated and Authenticated Attacks-Windows security features-Wireless scanning and Enumeration-Identifying wireless network defenses and counter measures- Gaining access to WPA- WEP.

MODULE III WEB HACKING 9

Web server Hacking: Web server vulnerability scanners – Canonicalization attacks – Web application Hacking – Database Hacking: Database Discovery – Database Vulnerabilities – Mobile Hacking: Android Devices.

MODULE IV TOOLS 9

Kali Linux: BeeF, Key logger, Wireshark, Maltego, Metasploitable-Hacking attacks: SQL injection attacks – Buffer overflow attacks - Privacy attacks.

MODULE V CASE STUDIES 9

System hacking: DNS High Jinx – Pwning the Internet - Hacking windows–Wireless application- Read It and WEP-Wireless hacking Application and data hacking - Session Riding.

L –45 ; TOTAL HOURS – 45

TEXT BOOKS:

1.Stuart McClure, Joel Scambray, George Kurtz “Hacking Exposed 7: Network Security Secrets & Solutions”, Seventh Edition, McGraw Hill Professional 2012

REFERENCES:

1.Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, 2011.
2.Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short., “Cyber Security Essentials”, John Wiley & Sons, Indiana,2018.<http://www.leanconstruction.org/readings.html>

3.Ankit Fadia —"Ethical Hacking", Second edition, Macmillan India Ltd, 2006

COURSE OUTCOMES:

CO1:Analyze the basics of Hacking and Information gathering.

CO2:Assess a variety of different types of Wireless security attacks

CO3:Apply the hacking techniques to secure the web Applications

CO4:Understandingthe tools for different attacks

CO5:Secure the web and wireless network password breach

Board of Studies (BoS) :

Academic Council:

17thBOS was held on 01.06.2022

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2
CO1			L											
CO2			M		H									
CO3				H	M									
CO4		H												H
CO5	L					M	M							H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Ethical hacking can help in lot of ways like it strengthens computer and network security by performing penetration testing, it enables one to take preventive measures to avoid any security breach situations.

CADX204	WEB TECHNOLOGY	L T P C
SDG: 9		3 0 0 3

COURSE OBJECTIVES:

COB1: Understand and compare the fundamentals of Web protocols and its features.

COB2: Learn the use of HTML tags and Identify appropriate style properties to design web pages using CSS.

COB3: Explore the significance of JavaScript and JQuery for Web design.

COB4: Familiarize with server-side scripting language via PHP.

COB5: Identify the principles of creating an dynamic web page with connectivity through MySQL.

MODULE I WEB ESSENTIALS 9

Introduction to WWW - Introduction to Network, Internet and Intranet, Application and Services, Internet Addressing – URL, Elements of Web – Web Page, Web 2.0, Web protocols and Web servers, Web Design Principles and Web site structure.

MODULE II HTML AND CSS 9

Basics of HTML, HTML Tags and attributes, Meta tags, Character entities, hyperlink, lists, tables, images, forms, divs, XHTML.

Basics of CSS, CSS properties for manipulating texts, background, colors, Gradients, Shadow Effects, borders, margins, paddings, transformations, transitions and animations, CSS box modal and CSS Flex, Positioning systems of CSS, CSS media queries.

MODULE III JAVASCRIPT AND JQUERY 9

Basics of JavaScript and Client-side scripting language, JavaScript syntaxes for variables, functions, branches and repetitions. JavaScript alert, prompt and confirm. Objects in JavaScript, Access/Manipulate web browser elements using DOM Structure, forms and validations, JavaScript events,

Basics of jQuery, jQuery syntaxes, jQuery selectors, events, effects, Access/Manipulate web browser elements using jQuery.

MODULE IV SERVER-SIDESCRIPTING LANGUAGE 9

Introduction to PHP and its syntax, combining PHP and HTML, understanding PHP code blocks like Arrays, Strings, Functions, looping

and branching, file handling, processing forms on server side, cookies and sessions.

MODULE V WEB CONNECTIVITY USING PHP, NODEJS & 9 MONGO DB

Introduction to PHP MyAdmin, Web database architecture, connection to MySQL server from PHP, Querying the database from the web, execution of MySQL queries from PHP, receiving data from database server and processing it on web server using PHP.

Full Stack Web Development overview Node JS, Asynchronous Programming, Node Package Manager, Express Module, Socket Programming. Mongo dB Overview, CRUD Operations, Queries.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. HTML&CSS: The Complete Reference, Fifth edition, Thomas A. Powell, 2010.
2. Ryan Benedetti, Ronan Cranley, Head First jQuery - A Brain-Friendly Guide, O'Reilly Media, 2011.
3. PHP Bible, Wiley Publication, Tim Converse, Joyce Park, 2002

REFERENCES:

1. Black Book, HTML 5, Dreamtech Press, 2016
2. Black Book, Web Technologies, Dreamtech Press, 2009

COURSE OUTCOMES:

CO1: Demonstrate the knowledge and ability to apply the design principles and techniques in creating websites.

CO2: Effective usage of HTML tags and Incorporate CSS properties to develop interactive and dynamic web pages.

CO3: Develop JavaScript and jQuery code to access the DOM structure of web document and object properties.

CO4: Build and deploy active web pages with help of server-side scripting PHP

CO5: Explore MySQL and implement a complete web page via connectivity.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1			H		H	M	M					M	H	
CO2			H		H	M	M					M	H	
CO3			H		H	M	M					M	H	M
CO4			H		H	M	M					M	H	H
CO5			H		H	M	M					M	H	H

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement :

Web Technology concepts taught in this course for the learners with respect to the course outcomes is measurable and useful in applying one's disciplinary knowledge and transferable skills to new/unfamiliar contexts. As the future industrial personnel, the learner would be able to improve skill set to demonstrate competence in the practical art of providing quality content in websites and social media.

CADX 205	SERVER OPERATING SYSTEM	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB 1: Explore the usage and features of Windows Server 2019 R2.

COB 2: Impart the fundamentals of core services of the domain controller

COB 3: Learn about the networking concepts in Server 2019

COB 4: Analyze thesecurity features of Windows Defender

COB 5: Comprehend the benefits of server core in Server 2019

MODULE I INTRODUCTION 9

Introduction to operating system and servers. Installing servers – planning for a server installation, choosing installation options, upgrading servers. Installing roles and features – installing using wizard, installing using PowerShell feature. Windows Admin Center (WAC) – installing, launching managing the WAC.

MODULE II CORE INFRASTRUCTURE SERVICES 9

Domain Controller – Introduction to Active Directory Domain Services (AD DS), Organizing the network using AD DS, User accounts, security groups, Active Directory Domain and Trusts, Active Directory administrative centers, dynamic access control. Domain Name System – different kinds of DNS records, DHCP versus static addressing.

MODULE III NETWORKING WITH WINDOWS SERVER 2019 9

Introduction to IPv6 – understanding IPv6 addresses, routing table, networking toolbox: ping, tracert, telnet. Hyper-V network virtualization – network controller, generic routing encapsulation, Microsoft azure virtual network. Azure network adapter.

MODULE IV HARDENING AND SECURITY 9

Windows Defender Advanced Threat Protection – installing and disabling windows defender. Windows Defender Firewall – Three windows firewall administrative consoles, installing windows defender, exploring the user interface.

MODULE V SERVER CORE 9

Introduction to sever core – interfacing with server core, Power Shell, setting the server hostname, joining the domain, remote Power Shell, Server manager, remote server, roles available in server core.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Jordan Krause, "Mastering Windows Server 2019", Packt Publishing, Second edition, 2019.
2. Kailash Jayaswal, "Administering DataCenters Servers, Storage and Voiceover IP", Wiley Publishing Inc. 2011
3. Thomas Lee, "Windows Server Automation and Power Shell Cookbook", Packt Publishing, Fourth edition, 2021.

REFERENCES:

1. Jason Eckert, "Hands-On Microsoft Windows Server 2019", Cengage Publications, Third edition, 2019.
2. Orin Thomas, "Windows Server 2019 Inside Out", Microsoft Press, First Edition, 2019.

COURSE OUTCOMES:

CO 1: Understand the features of windows server 2019.

CO 2: Study about the working of a Domain controller.

CO 3: Explore the networking concepts behind the server.

CO 4: Deploy the security measures deployed in Windows Server.

CO 5: Grasp the role of a server core in detail.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Get to know about the basics of Windows Server Operating System 2019. This course helps the student to gain real time knowledge about the working, networking, and security procedures of the server operating system and thus prepares the student for the placement.

CADX 207	BIG DATA ANALYTICS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB 1: Introduce the characteristics of a Big Data system.

COB 2: Understand the big data framework and components of Hadoop and configuration requirements.

COB 3: Give training to load the dataset into HDFS.

COB 4: Provide training to configure Google Colab for Machine learning algorithm implementation

COB 5: Learn the big data streaming processes applicable to the industry use cases

MODULE I INTRODUCTION 9

Introduction – Why Big data - What is big data – Facts about Big Data - importance of Big Data - Evaluation of Big Data – Market Trends – Sources of Data Explosion – Types of Data – Case Study for Netflix and the house of card. Need of Big Data – Big Data and its sources – Characteristics of Big Data – Difference between Traditional IT Approach and Big Data Technology.

MODULE II HADOOP ECOSYSTEM 9

Introduction – Why Hadoop – What is Hadoop – History and Milestone of Hadoop – Core Components of Hadoop – Difference between Regular File System and HDFS – Common Hadoop Shell Commands – Hadoop Configuration.

MODULE III HADOOP DISTRIBUTED FILE SYSTEM 9

Concepts and Architecture - Data Flow (File Read, File Write) - Fault Tolerance - Java Base API - Different Daemons in Hadoop cluster (Name Node, Secondary Name Node, Job Tracker, Task Tracker and Data Node) - Loading a dataset into the HDFS.

MODULE IV CONFIGURING GOOGLE COLAB 9

Introduction – Google Colab – What is Google Colab – First Colab Notebook – Saving Your Work – Installing ML Libraries - Using Free GPU –Install and configure Hadoop, set working directory and various processes– Import dataset in Google Colab.

MODULE V INDUSTRY USE CASES 9

Big Data Use Cases. Real time Big Data Streaming, Big data streaming framework, data streaming process, tools for big data streaming, industry use

cases for big data streaming. Capabilities of Big Data – Handling Limitations of Big Data - Technologies Supporting Big Data.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Seema Acharya (Author), SubhashiniChellappan, Big Data and Analytics(2015). Wiley Publication.
2. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data (2015), EMC Education Services.
3. Big Data, Black Book: Covers Hadoop 2, Map Reduce, Hive, YARN, Pig, Rand Data Visualization (2016), DT Editorial Services

REFERENCES:

1. Tom White, Hadoop: The Definitive Guide, 4thEdition(2015)

COURSE OUTCOMES:

After completing this course, students will be able to

CO1: distinguish between BIG data analytics with traditional approaches of providingIT solutions and select the appropriate mathematical model for the give problem.

CO2: design exclusive Hadoop framework for the undertaken project

CO3: control the data flow of both file read operations and file write operations in HDFS.

CO4: configure Google Colab for Machine Learning algorithm implementation.

CO5: provide business intelligence from big data analytics solution methodologies.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2
CO1	M	H												
CO2			H											
CO3					M									
CO4					H								H	
CO5											H			H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4:

Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:The learner would be able to design and provide predictive analytical solutions with much more accuracy level after incorporating big data analytics and apply in the socially relevant environment related weather condition prediction problems, health care predictive analytical solutions for the society and energy analytics for building SMART cities.

TEXT BOOKS:

1. Rafael C. Gonzalez / Richard E. Woods, "Digital Image Processing", Pearson Publishers, 4th edition (January 1, 2018)

REFERENCES:

1. Jain Anil K. "Fundamentals of Digital Image Processing", PHI learning, Pvt. Ltd., 2011.
2. Chris Solomon (Author), Toby Breckon Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab 1st Edition Wiley January 2011.

COURSE OUTCOMES:

CO1: Remember the concepts in digital image processing.

CO2: Illustrate the transformation techniques in digital image processing.

CO3: Analyse the transformation, restoration, segmentation techniques in image processing

CO4: Apply the segmentation and compression techniques in image processing

CO5: Demonstrate the object recognition techniques for real time applications.

Board of Studies (BoS):

16th BoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	M									M		L		
CO2	H	H	M	M	M		M		L		M	L		M	
CO3	H	H	M	M	M		M		L		M	L		M	
CO4	H	H	M	M	M		M		L		M	L		M	
CO5	H	H	M	M	M		M		M		M	H			H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Digital image processing deals with processing of images which are digital in nature. Study of the subject is motivated by its applications. The first application is in improvement of pictorial information for human perception i.e. enhancing the quality of the image so that the image will have a better look. The second is for

autonomous machine applications which have wider applications in industries, particularly for quality control in assembly automation and many similar applications. This course will introduce various image processing techniques, algorithms and their applications to promote inclusive and sustainable industrialization and foster innovation.

CADX225	WEB APPLICATION SECURITY	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand Web Application Security concepts and its Futures.

COB2: Recognize the Web Application technologies.

COB3: Analyze various types of attacks in Web Applications

COB4: Apply tools for handling vulnerabilities

COB5: Create a secured real Web Applications.

MODULE I INTRODUCTION 9

Web Application Functions - Benefits of Web Applications - Core Security Problems- Users Submit Arbitrary Input-Future of Web Application Security - Handling User Access : Authentication, Session Management and Access Control - Boundary Validation-Handling Attackers - Managing the Application

MODULE II WEB APPLICATION TECHNOLOGIES 9

HTTP Headers- General Headers-Request Headers - Cookies - Status Codes - HTTP Authentication - Web Functionality- Server-Side Functionality: Java Platform, ASP.NET and PHP- Client-Side Functionality: HTML, Hyperlinks, Forms and JavaScript – Encoding Schemes- URL Encoding- Unicode Encoding.

MODULE III AUTHENTICATION AND SESSION MANAGEMENT 9

Authentication Technologies - Design Flaws in Authentication Mechanisms -Brute Forcible Login - Implementation Flaws in Authentication- Securing Authentication- Attacking Session Management-Weaknesses in Session Token Handling- Securing Session Management: Per Page Tokens.

MODULE IV WEB APPLICATION SECURITY ATTACKS AND TOOLS 9

Injecting Code –ByPassing a Login—Finding SQL Injection Bugs- Extracting Useful Data- Preventing SQL Injection - Cross-Site Scripting (XSS) - Finding XSS Vulnerabilities-Open-Source Web Application Security tools: ZAP (Zed Attack Proxy), W3af (Web Application Attack and Audit Framework) and Iron WASP (Iron Web Application Advanced Security testing Platform)

MODULE V APPLICATIONS AND CASE STUDY 9

Web Spidering - Discovering Hidden Content – Securing Web Server Software– Case study : Password Change Function, Beating a Business Limit, inspection of code quality to perform automatic reviews and Erasing an Audit Trail, Top ten Web Application security solutions

L – 45; TOTAL HOURS –45**TEXT BOOKS:**

1. Andrew Huffman, "Web Application Security: Exploitation and Counter Measures for Modern Applications", O'ReillyMedia Publishing, March 1st Edition, 2020.
2. Bryan Sullivan and Vincent Liu, "A Web Application Security, A beginners Guide", McGraw Hill Publication, 2011.
3. Dafydd Stuttard and Marcus Pinto "The Web Application Hacker's Hand book: Discovering and Exploiting Security Flaws", Wiley Publishing, 2nd Edition, September, 2011.

REFERENCES:

1. Harvey Deitel, Paul Deitel, Abbey Deitel "Internet and World Wide Web How to Program", fifth edition, Pearson Education, ISBN: 13:978-0-273-76402-1, 2018.
2. Peter Yaworski, "Real – World Bug Hunting: A Field Guide to Web Hacking", William Pollock Publishing, 1st Edition, 2019, ISBN: 13:978-0-273-76402-1.
3. Mike Shema, Syngress, "Seven Deadliest Web Application Attacks", Elsevier Science Publishing, 20th February 2020, ISBN: 1597495441.

COURSE OUTCOMES:

CO1: Describe Web Application Security and its futures

CO2: Illustrate various Web Application technologies

CO3: Classify the different types of attacks.

CO4: Identify the Web Application Security tools.

CO5: Design a secure real time Web Application Security

Board of Studies (BoS):

17thBoS held on 01.06.2022

Academic Council:

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1														
CO2		H	M											
CO3			H	H	M								H	
CO4					H				M		M		H	H
CO5	L													H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Course Outcomes have achieved the Curricula need and Learner would acquire complex problem solving skills with critical thinking ability. The basics of Web Application Security were taught in this course to understanding the insights and importance of Web Application Security will motivate the student to deploy the Web Application Security based business applications in real-time scenario.

CADX 212	FUNDAMENTALS OF DATACENTER	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1:ToKnow about Datacenter fundamentals.

COB2:ToMake the students to understand the basic Concepts of Datacenter architecture.

COB3:ToSetup services provided by datacenters.

COB4:To implement network infrastructure in a Datacenter,

COB5:To implement server frames fault tolerance, Data center availability, network implementation and Disaster recovery.

MODULE I OVERVIEW OF DATA CENTERS 9

Datacenters Defined - Datacenter Goals - Datacenter Facilities - Roles Datacenters in the Enterprise –Roles of Datacenters in the Service Provider Environment -Application Architecture Models. The Client/Server Model and Its Evolution - Three Tier Model –Multitier Architecture Application Environment –Datacenter Architecture.

MODULE II DATACENTER REQUIREMENTS 9

Datacenter Prerequisites - Required Physical Area for Equipment and Unoccupied Space –Required Power to Run All the Devices –Required Cooling and HVAC -Required Weight - Required Network Bandwidth - Budget Constraints -selecting a Geographic Location - Safe from Natural Hazards - Safe from Man-Made Disasters -Availability of Local Technical Talent - Abundant and Inexpensive Utilities Such as Power and Water – Selecting an Existing Building(Retrofitting) –tier standard.

MODULE III DATACENTER DESIGN 9

Characteristics of an Outstanding Design - Guidelines for Planning a Data Centre - Data Centre Structures - No-Raised or Raised Floor - Aisles - Ramp - Compulsory Local Building Codes – Raised Floor Design and Deployment - Plenum - Floor Tiles - Equipment Weight and Tile Strength - Electrical Wire ways - Cable Trays - Design and Plan against Vandalism. Data Centre Design Case Studies - Modular Cabling Design – Points of Distribution - ISP Network Infrastructure - ISP WAN Links – Datacenter Maintenance.

MODULE IV INTRODUCTION TO SERVER 9

Types of server farms and data center - internet server farm - intranet server farm - extranet server farm - internet datacenter - corporate datacenter - software defined datacenter – datacenter topologies – Aggregation Layer – Access Layer - Front-End Segment – Application Segment - Back-End Segment – Storage Layer – Datacenter Transport Layer – Datacenter Services – IP Infrastructure Services – Application Services – Security Services - Storage.

MODULE V BUSINESS CONTINUITY AND DISASTER RECOVERY FUNDAMENTALS 9

Business continuance infrastructure services - the need for redundancy - Information availability - BC terminology - BC planning life cycle - BC technology solutions – backup and recovery considerations - backup technologies - Uses of local replicas – Local replication technologies – Restore and restart considerations – Modes of remote replications – remote replication technologies.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Mauricio Arregoces, Maurizio Portolani, "DataCenter Fundamentals", Cisco Press.2008
2. Kailash Jayaswal,"Administering Data Centers-Servers, Storage and VoiceoverIP", Wiley PublishingInc.2011.

REFERENCES:

1. IP Storage Networking by: Gary Oreinstein, Addison Wesley Professional,2006.
2. Information Storage and Management G. SomasundaraAlokSrivastava, Wiley.2012
3. Administering Data-Centers, KailashJayaswal, Wiley.2015

COURSE OUTCOMES:

Students will be able to

CO1: Describe the history of datacenters,how they have evolved over the years, different facilities and the requirements.

CO2: Analyze different requirements of data center.

CO3: Effectively designing a data center and various server.

CO4: Applies different types of servers based on the requirement.

CO5: Demonstrate an understanding of business continuity and disaster recovery fundamentals.

Board of Studies (BoS):16thBoS was held on 23.12.2021**Academic Council:**18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H											M		
CO2			H		H									H	
CO3			H		H				H					H	
CO4				H					H				M		
CO5			H												

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Fundamentals of datacenter help the learners to analyze, design the data center based on the requirements and they can also ably to design the servers according to the need. The proposed concept will improve the learners to implement the concepts to recover the data from the disasters.

CADX214	EXPLORATORY DATA ANALYSIS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB 1: Introduce empirical research and Data collection methods for business or social problem.

COB 2: Learn the difference between Nominal and Metric variables.

COB 3: Formulate and test the statistical hypothesis for the undertaken problem.

COB 4: Learn to apply appropriate ANOVA technique for the given dataset.

COB 5: Learn to design the experimental setup and perform the exploratory data analysis on different use cases.

MODULE I INTRODUCTION 9

Two Types of Statistics- The Generation of Knowledge Through Statistics - The Phases of Empirical Research– Disarray to Dataset– Data Collection- Level of Measurement - Scaling and Coding – Missing Values – Outliers and Obviously Incorrect Values.

MODULE II NOMINAL VARIABLES & METRIC VARIABLES 9

First Steps in Data Analysis– Measures of Central Tendency–Measures of Concentration–Using the Computer to Calculate Univariate Parameters– Bivariate Scale Combinations– Association Between Two Nominal Variables – Association Between Two Metric Variables– Relationships Between Ordinal Variables – Measuring the Association Between Two Variables with Different Scales.

MODULE III HYPOTHESES TESTING 9

Concept of Hypothesis: Procedure in Hypothesis Testing-Formulate a Hypothesis-Setup a Suitable Significance Level-Select Test Criterion-Compute and Decision Making - Types of Errors-Parametric Tests.

MODULE IV ANALYSIS OF VARIANCE 9

Analysis of variance: One-way ANOVA–Two-way ANOVA-Concepts and problems –Non-Parametric Tests – Chi-square One Sample Test-The McNemar Test.

MODULE V BUSINESS CASE STUDIES 9

Explorative Data Analysis Business case studies on different verticals.-Basic spreadsheet modeling-Tables–Validating data–Summarizing data by using histograms and Pareto charts-Filtering data and removing duplicates-

Summarizing data by using descriptive and inferential statistics.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Thomas Cleff, “Exploratory Data Analysis in Business and Economics”, An Introduction Using SPSS, Stata, and Excel, Springer Publications.
2. Allen B.Downey, “Think Stats: Exploratory Data Analysis (2nd edition)”, (2014).
3. S.H.C. du Toit, A.G.W. Steyn and R.H. Stump“Graphical Exploratory Data Analysis”, SpringerPublishers.
4. Ronald Christensen “Analysis of Variance, Design, and Regression: Applied Statistical Methods”June 1996.
5. G.C Beri, “Marketing Research “Fifth Edition, McGraw-Hill Education India Private Limited, Seventh Reprint,2016
6. Wayne L. Winston“Microsoft Excel 2016 Data Analysis and Business Modeling”.

REFERENCES:

1. Think Stats: Exploratory Data Analysis (2nd edition) by Allen B.Downey (2014).

COURSE OUTCOMES:

After completing this course, students will be able to

CO 1:collect data scientifically using different methods

CO 2: distinguish between different explanatory variables and target vector and do feature engineering.

CO 3: design the experimental setup and perform exploratory data analysis.

CO 4: apply appropriate ANNOVA technique for the given problem

CO 5: derive business insights from the explorative statistical data analysis

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	M	M									H			
CO2	H													
CO3													H	H
CO4					H									
CO5							H			H				

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4:Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: The exploratory data analysis skill would help the learner to design the data collection methodology for the undertaken business or social problem. It further helps to collect data scientifically and apply the appropriate statistical technique using the state of the art software technologies to perform feature engineering and take data driven decisions.

CADX215	COMPUTER GRAPHICS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to help students to

COB1: familiarize in graphics hardware device.

COB2: implement various drawing algorithms.

COB3: introduce two dimensional graphics and their transformations.

COB4: conceptual implementation of clipping and introduce the concept of graphic tool.

COB5: implement the three dimensional viewing and clipping algorithms.

MODULE I INTRODUCTION 9

Survey of computer graphics- overview of graphics systems – video display devices- Raster scan systems- Random scan systems- Interactive Input devices-Hard copy Devices- Graphics Software- output primitives – points and lines.

MODULE II GRAPHICS DRAWING 9

Line drawing algorithms – loading the frame buffer - line function- Circle generating algorithm - Ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

MODULE III TWO DIMENSIONAL TRANSFORMATION 9

Two dimensional basic transformation - Matrix representations and homogeneous coordinates-composite transformations- Matrix representation – other transformation- Two-dimensional viewing – Window- to –viewport coordinate transformation.

MODULE IV CLIPPING AND GRAPHICS TOOL 9

Clipping algorithms – point clipping- line clipping - polygon clipping – curve clipping-text clipping – exterior Clipping. Adobe Photoshop –using Photoshop tools ,viewing images, working with palettes, image basics, working with selection.

MODULE V THREE DIMENSIONAL TRANSFORMATION 9

Three dimensional basic transformations – Three dimension viewing - Projection – Orthogonal and oblique parallel projection- Three dimensional

clipping algorithms – visible surface detection methods- back face detection, depth-buffer method, A-buffer method, scan-line method. Case study: Visual art program, Visual content preparation.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. John F. Hughes, Andries Van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley ,”Computer Graphics: PrinciplesandPractice”,3rd Edition, Addison-Wesley Professional,2013.
2. Donald Hearn and Pauline Baker M, “Computer Graphics”, Prentice Hall, New Delhi, 2007.

REFERENCES:

1. Jeffrey McConnell, “Computer Graphics: Theory into Practice”, Jones and Bartlett Publishers, 2006.
2. Donald Hearn and M. Pauline Baker, Warren Carithers, “Computer Graphics With Open GL”, 4th Edition, Pearson Education,2010.
3. Adobe Photoshop LE – Classroom Book.

COURSE OUTCOMES:

The completion of this course the students will be able to:

CO1:Understand the concept of graphics system devices

CO2: Develop and implement the drawing algorithms.

CO3: Apply geometrical transformation in 2D.

CO4:Analyze various clipping algorithm in Graphics system and understand the graphic tool

CO5: Appraise the best clipping algorithm in three dimensional viewing.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	H				L								H		
CO2		H	M										H	H	
CO3	H		M	L				M					H		M
CO4	H	M	M	M									H	H	
CO5	H	M	M	L									H		

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: To analyses design and develop skill taught in this course for the learners with respect to the course outcomes. Learners will enhance their skills and to become a graphics designer through innovative approaches.

CADX 221	KNOWLEDGE ENGINEERING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Recognize the differences between data, information, knowledge and its components.

COB2: Familiar with the various knowledge acquisition techniques.

COB3: Understand the fundamental principles of logic-based knowledge representation and reasoning.

COB4: Learn the knowledge representation tools.

COB5: Apply knowledge representation techniques in various applications.

MODULE I INTRODUCTION 9

Introduction to data - Information and knowledge - Knowledge Engineering and Knowledge Management - Need for Knowledge Engineering- Steps for Knowledge Engineering - Role of Knowledge Engineering in Artificial Intelligence - Components of Knowledge in Artificial Intelligence.

MODULE II KNOWLEDGE ACQUISITION 9

Information Gathering - Information Retrieval - Knowledge Acquisition Techniques - Applications of Natural Language processing: Morphology - Lexicon - Syntax and Semantics – Parsing -POS tagging - Named Entity tagging.

MODULE III KNOWLEDGE REPRESENTATION AND REASONING 9

Knowledge Representation and Logic - Rules and Representation: Inference Rules and Propositional Logic - Predicate Logic and Reasoning - Knowledge Representation Languages - Non-Monotonic Reasoning - Probabilistic Reasoning.

MODULE IV ONTOLOGY 9

Overview- Classifications - Methodology - Ontology Vs Language, Ontology Tools: Resource Description Framework (RDF) – Lightweight ontologies: RDF Schema – Web Ontology Language (OWL) – A query language for RDF: SPARQL, Ontology Engineering Semantic web and Web 2.0 Applications of Semantic Web.

MODULE V APPLICATIONS**9**

Natural Language Processing Applications: Speech Recognition – Chatbots- Email filtering - Sentiment Analysis - Recruitment - Social media analytics – Case Study.

TOTAL HOURS –45**TEXT BOOKS:**

1. Ela Kumar, “Knowledge Engineering”, I.K International Publishing, First Edition, ISBN 978-93-85-909-27-6, 2018.
2. Hamed Fazlallahtabar, “Knowledge Engineering: The Process Paradigm”, CRC Press, First Edition, ISBN: 978-0-367-51736-6, 2020.
3. Kendal, Simon, Creen, Malcolm, An Introduction to Knowledge engineering, Springer first edition, 2007.

REFERENCES:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A modern approach (Prentice Hall edition , second edition, 2002).
2. P. Jackson, Introduction to expert systems, Addison Wesley, 1999.
3. John Debenham, Knowledge Engineering: Unifying Knowledge Base and Database Design, Springer, 1998.

COURSE OUTCOMES:

CO1: Recognize the different stages of knowledge based systems.

CO2: Design knowledge acquisition system for an application.

CO3: Understand the formal approaches for knowledge representation and reasoning.

CO4: Able to apply knowledge engineering tools.

CO5: Analyze and solve AI based case studies.

Board of Studies (BoS):

16th BoS was held on
23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	M													
CO2			M										M	
CO3		H				M								
CO4				L										
CO5					H			L						M

Note:L-LowCorrelation M-MediumCorrelation H-HighCorrelation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation .

Statement : By learning the concepts of Knowledge representation , the students are able to create Artificial Intelligence based software, which in turn promotes to sustain in future industrial and infrastructural projects

CADX 226	CRYPTOGRAPHY AND NETWORK	L	T	P	C
	SECURITY	3	0	0	3

SDG: 9

COURSE OBJECTIVES:

COB1: Learn the security architecture, policies, attacks and various encryption techniques.

COB2: Understand fundamental knowledge on the concepts of various Block cipher modes and working principles of Symmetric Key Cryptography.

COB3: Describe the procedure of public key cryptosystems and working principles of public key Cryptography.

COB4: Compare the concept of hash functions & digital signatures and applying the techniques

COB5: Recommend the methods to secure the information during Online transactions.

MODULE I INTRODUCTION 9

Network Services, Mechanisms and attacks - Security architecture - Network security model - Security trends – Legal, Ethical and Professional Aspects of Security - Need for Security at Multiple levels, Security Policies - Security attacks - Classical encryption techniques: substitution techniques, transposition techniques, Steganography.

MODULE II SYMMETRIC KEY CRYPTOGRAPHY 9

Symmetric key ciphers - Block cipher design principles - Block cipher mode of operation - Data Encryption Standard - Block cipher Principles of DES - Strength of DES - Differential and linear cryptanalysis - Advanced Encryption Standard - Evaluation criteria for AES - RC4 - Key distribution.

MODULE III PUBLIC KEY CRYPTOGRAPHY 9

Asymmetric Key Ciphers: Public key cryptography - Principles of public key cryptosystems - RSA cryptosystem – Key distribution – Key management – Diffie–Hellman key exchange algorithm - ElGamal cryptosystem – Elliptic curve arithmetic - Elliptic Curve Cryptography.

MODULE IV HASH FUNCTIONS AND DIGITAL SIGNATURES 9

Authentication requirement – Authentication function – message authentication code (MAC) – Hash function – Security of hash function and MAC – MD5 - SHA - Hash-based Message Authentication Code (HMAC) – Cipher-based Message Authentication Code (CMAC) - Digital signature and authentication protocols – Digital Signature Standard.

MODULE V SECURITY PRACTICE 9

Electronic Mail security - IP security - Web Security - Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls - Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewalls design principles - Virus and related threats – Practical implementation of cryptography and security in the real life applications.

L – 45 ; TOTAL HOURS 45

TEXT BOOKS:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2010.
2. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

REFERENCES:

1. Bruce Schneier and Neils Ferguson, “Practical Cryptography”, First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
2. Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication in Public World”, PHI 2002.

COURSE OUTCOMES:

CO1: Gain and master the different security algorithms.

CO2: Compare different symmetric key cryptography techniques.

CO3: Apply the public key cryptography algorithms in problem solving.

CO4: Practice the hash functions & digital signatures and examine the techniques.

CO5: Implement the Cryptography techniques for the real time applications.

Board of Studies (BoS) :

17th BOS was held on
01.06.2022

Academic Council:

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1			L											
CO2							M							
CO3			M				M						M	
CO4					M	M	M						L	
CO5			H										H	L

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

The learner will be able to develop secured web transactions for the real life applications.

TECHNOLOGY CORE LAB I (SEMESTER IV)

CADX 209	SERVER OPERATING SYSTEM	L	T	P	C
SDG: 9	LABORATORY	0	0	4	2

COURSE OBJECTIVES:

COB1: Installation of VMware and Windows Server operating system 2019.

COB2: Execute the basic configurations of server operating system.

COB3: Understand the functionality of server operating system.

COB4: Implement the concepts of remote management.

COB5: Create group file permission for specific user.

LIST OF PROGRAMS

1. Installation of VMware in Windows Operating System.
2. Installation of Windows Server 2019.
3. Installation of Active Directory domain services and adds a Client to the domain.
4. Administrator of a company named ABC needs to create a group by assigning filePermissions to specific users and configure in a way that the file should be made Available even in offline mode.
5. Consider two physical disk of 1 TB each, where one disk has been damaged due natural calamities. Configure a high availability storage technique having fault tolerance to overcome the above scenario.
6. Creating Virtual machine in windows server.
7. A company named XYZ had started its branch office in Bangalore and Coimbatore. Configure in such that they should come under the head office and able to access their resources from the same.
8. Configuration of windows server for remote management
9. Rahul wants to host a file in such a way that the changes made by the client have to be updated in the database of the server. Configure the information service technique that performs the above activity.
10. Create a scenario based on real time domain.

P – 60 ; Total Hours - 60

TEXT BOOKS AND REFERENCES:

1. Windows Server 2019 Inside Out, 1st edition by Orin Thomas (Author).
2. <https://www.microsoft.com/en-in/evalcenter/evaluate-windows-server-2019>
3. <https://docs.microsoft.com/en-us/windows-server/get-started/get-started-with-windows-server>

COURSE OUTCOMES:

CO1: Installing VMware and windows server 2019 in machine.

CO2: Implement basic configurations of windows server 2019.

CO3: Develop skills on file management concepts.

CO4: Create group file permission for specific user.

CO5: Implement the remote management.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO 12	PSO 1	PSO 2
CO1					M									M
CO2					M	M		L			M		M	
CO3	L							M		L			M	
CO4		M	H	L			H	M	L			L	L	M
CO 5			H				M					M	M	M

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: To analyze, design and develop Linux skills and practically taught in this course for the learner's benefits. Learners will gain practical knowledge and become software professionals through innovative approach.

CADX208	WEB TECHNOLOGY	L	T	P	C
SDG: 9	LABORATORY	0	0	4	2

COURSE OBJECTIVES:

COB1: Understand and develop web pages that present information, graphics and hypertext links to other web pages in a cohesive manner.

COB2: Identify most HTML tags and CSS properties and use a text editor to construct the basic HTML and CSS structure for a webpage.

COB3: To validate forms using JavaScript and explore jquery to implement effective web page.

COB4: To develop an ability to design and implement static and dynamic website using PHP

COB5: To understand how effectively establish a web connectivity with the help of MySQL.

PRACTICALS

List of Experiments:

1. Create a webpage to illustrate text formatting tags, order and unordered list.
2. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.
3. Write HTML code to create a Web Page that contains an Image at its Centre.
4. Image tags & embedding a multimedia on to a web page (video, audio, zip).
5. Create a web page with all types of Cascading style sheets.
6. Design a web page using different CSS properties like border, background, text, and font.
7. Develop a simple calculator using JavaScript.
8. Design a digital clock using JavaScript.
9. Demonstrate string and math objects predefined methods available in JavaScript.
10. Create a paragraph element with some text and append it to the end of the document body using jQuery.
11. Using jQuery insert a DOM element after all paragraphs.
12. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
13. Write a PHP program to Connect MySQL Database with PHP Using PDO (PHP Data Object).

14. Write a program to use Node.js REPL and create Node.js Module.
15. Create a Database, Collection using MongoDB and write a query to drop, update, and insert a document in Database.

P – 60 ; Total Hours - 60

TEXT BOOKS:

1. Developing Web Application, Wiley India Publication, Ralph Moseley, Wiley India, 2007.
2. Web Enabled Commercial Application Development Using HTML, DHTML, PERL, Java Script, BPB Publications, Ivan Bayross, 2005

REFERENCES:

1. HTML: The Complete Reference, Thomas A. Powell , 2000
2. Beginning JavaScript 2nd Edition, Wrox, Nicholas C. Zakas, 2004
3. PHP Bible, Wiley Publication, Tim Converse, Joyce Park, 2002

COURSE OUTCOMES:

On completion of the course, Students will be able to

CO1: demonstrate and implement the basics of HTML, CSS to develop interactive for web page

CO2: design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.

CO3: explore and deploy client-side scripting language via JavaScript and jQuery.

CO4: design the web environment in a professional way using PHP.

CO5: Overall hands-on learning on web technology concepts offers the learners much needed knowledge for web design and development.

Board of Studies (BoS):

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1				H					H					
CO2			M								M			
CO3		L	H	H			M		L			M	H	H
CO4			M	M										
CO5												H		

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Web Technology concepts taught in this course motivates the learners to develop an interactive and dynamic web page. And the learning attained in this course is useful in applying one's disciplinary knowledge and transferable skills to new/unfamiliar contexts to face the real-time problems in the web world.

CADX 211	BIG DATA ANALYTICS LABORATORY	L	T	P	C
SDG: 4		0	0	4	2

COURSE OBJECTIVES:

COB1: Introduce the big data system and learn to devise the big data strategy

COB2: Train the installation procedure of HDFS in Google COLAB

COB3: Learn the ETL techniques and preprocessing the data

COB4Train the basic commands of Hadoop

COB5: Learn the big data streaming concepts, big data analytics and insights

LIST OF PROGRAMS

1. Hadoop Installation in Google Colab
2. Implement basic commands in Hadoop
3. Import data from MySQL into HDFS
4. Exporting data from HDFS to MYSQL
5. Hadoop Installation – Pseudo Distributed Mode (YARN)
6. File Management tasks in Hadoop
7. Word Count Map Reduce program to understand Map Reduce Paradigm
8. Implementing Matrix Multiplication with Hadoop Map Reduce.

CASE STUDY1:

Experiment 1:

Due to the advent of new technologies, devices, and communication means like social networking sites, the amount of data produced by mankind is growing rapidly every year. The amount of data produced by us from the beginning of time till 2003 was 5 billion gigabytes. If you pile up the data in the form of disks it may fill an entire football field. The same amount was created in every two days in 2011, and in every ten minutes in 2013. This rate is still growing enormously.

Though all this information produced is meaningful and can be useful when processed, it is being neglected. By 2020, 1.7megabytes of data will be created every second, for every person on earth. There are different uses of Big Data, but not only limited to, Industry influencers, academicians, and other prominent stakeholders certainly agree that big data has become a big game changer in most, if not all, types of modern industries over the last few years. As big data

continues to permeate our day-to-day lives, there has been a significant shift of focus from the hype surrounding it to finding real value in its use.

Considering Big Data in general, explain different use cases for below mentioned domain and comment how companies are converting Big Data into profit:

- Healthcare
- Education
- Agriculture
- Space Technology

Experiment 2: Prepare infrastructure for setting up single node Hadoop cluster.

Experiment 3: Install all the software to set up single node Hadoop cluster.

Experiment 4: Configuration of single node Hadoop cluster and testing by creating directory at HDFS location

Experiment 5: You need to find the location of below Hadoop configuration file and understand the purpose of different attributes mentioned in below xml files. hdfs-site.xml, core-site.xml, yarn-site.xml

Experiment 6: You need to perform 20 basics Hadoop commands on single node Hadoop cluster. (Faculty will share commands)

Experiment 7: Install IDE to code and compile map reduce framework.

Experiment 8: You need to program Mapper Class, Reducer Class and Driver Class for map reduce word count Job.

Experiment 9: You need to find out word count job for the given input file provided by faculty.

Experiment 10: You need to trouble shoot log file generated in experiment Number 09 and note all the steps involved in job execution

Experiment 11: You need execute word count job based on 0 reducer, 2 reducer, Default reducer & 4 reducer and observe different outputs.

Case Study 2: Consider a scenario; you are working for a start-up company. Your cluster size is 10 Node. Number of data node in your cluster is 09. The size of each data node of your cluster is 2 TB. Currently you are working on 5 Tb of Data with Replication factor 03. Recently you got a new project from your client. You are expecting 20Tb of data to be processed in your cluster. Based on above scenario, you need to explain below:

1. How many data node you are going to add in your cluster?
2. What will be your new cluster size?

3. What will be your new data size considering Replication factor?
4. What will be your new data size considering only original data (without Replication)?
5. What will be your total number of task tracker in your cluster?

P – 60 ; Total Hours - 60

REFERENCES:

1. Big Data, Black Book: Covers Hadoop 2, Map Reduce, Hive, YARN, Pig, Rand Data Visualization (2016), DT Editorial Services
2. Tom White, Hadoop: The Definitive Guide, 4thEdition(2015)

COURSE OUTCOMES:

After completing this laboratory, students will be able to

CO1: perform explorative data analysis of the undertaken business or social problem.

CO2: install and configure Hadoop and HDFS in Google Colab

CO3: extract, transform and load data into HDFS

CO4: implement Map-Reduce program.

CO5: provide business competitiveness by processing big data streaming and delivering business insights.

Board of Studies (BoS) :

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1			H											
CO2					H									
CO3					M			H						
CO4														H
CO5										H				

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: The learner would be able to devise the big data strategy based on the business domain and vertical of the undertaken study.

The learner would learn to extract the data from the required data source and after preprocessing the data, would be able to transform and load the data into the google cloud laboratory system. Perform big data analytics using machine learning algorithms and provide required insights for effective decision making

CADX 222	DIGITAL IMAGE PROCESSING LABORATORY(MATLAB)	L	T	P	C
		0	0	4	2

SDG: 9

COURSE OBJECTIVES:

COB1: Understand the basic operations on Image.

COB2: Learn the use and need of sharpening and smoothing filters in frequency and spatial domain.

COB3: Examine the effect of compression techniques.

COB4: Familiar with edge detection techniques and their applications.

COB5: Explore the need of object detection and recognition.

PRACTICALS

List of Experiments:

1. Display an Image, Conversion of an image from gray scale to Binary, RGB.
2. Implementation of Relationships between Pixels.
3. Implementation of Arithmetic, Set operations and Transformations of an Image.
4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization.
5. Display of bit planes of an Image.
6. Display of FFT(1-D & 2-D) of an image.
7. Implementation of Image Smoothing Filters(Mean and Median filtering of an Image).
8. Implementation of image sharpening filters.
9. Image Compression by DCT,HUFFMAN coding.
10. Edge Detection using Gradient Filters, Sobel and Canny edge detection Algorithm.
11. Implementation of image restoring techniques.
12. Program for object detection and recognition.

P –60 ; TOTAL HOURS –60

TEXT BOOKS:

1. Rafael C. Gonzalez / Richard E. Woods, "Digital Image Processing", Pearson Publishers, 4th edition (January 1, 2018)

REFERENCES:

1. Jain Anil K. "Fundamentals of Digital Image Processing", PHI learning, Pvt. Ltd., 2011.

2. Chris Solomon (Author), Toby Breckon Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab 1st Edition Wiley January 2011.

COURSE OUTCOMES:

CO1: Remember basic operations, functions used on Images.

CO2: Perform arithmetic, set operations and transformation on images.

CO3: Apply image smoothing, sharpening in spatial and frequency domain.

CO4: Analyze the application of image compression techniques.

CO5: Evaluate the object detection and recognition technique.

Board of Studies (BoS) :

Academic Council:

17thBOS was held on 01.06.2022

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PO 12	PSO1	PSO2
CO1	H	M									H		L	
CO2	H	H	M	M	H	L	M		L		H			M
CO3	H	H	M	M	H	L	M		L		H	H		M
CO4	H	H	M	M	H	L	M		L		H	H		M
CO5	H	H	M	M	H	L	M		M		H	H		

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

In today's world many messages are exchanged in terms of images. To meet future challenges in handling image data, our industries and infrastructure must be upgraded. This course helps the learners to promote innovative sustainable technologies for Digital image processing. Study of Digital image processing recognizes the importance of research and innovation for finding solutions to social, economic and environmental challenges.

CADX 227	ETHICAL HACKING LAB	L	T	P	C
		0	0	4	2

SDG: 9

COURSE OBJECTIVES:

COB1: Provide the knowledge for information gathering.

COB2: Cover the fundamentals of information gathering tools

COB3: Explore Knowledge about Wireshark

COB4: Build the keylogger to capture keystroke

COB5: Examine the vulnerability analysis of system using live OS

PRACTICALS

List of Experiments:

1. Installing Oracle VMbox and Kali Linux.
2. Information gathering using the Harvester
3. Open Source Intelligence Gathering Using OSINT Framework.
4. Use Google and Whois for Reconnaissance.
5. Using a) TraceRoute, b) ping, c) ifconfig(LINUX), ipconfig(WINDOWS), d) netstat Command and e) charactermap
6. Databreach test of email and password using haveibeenpwned.
7. Use Wireshark sniffer to capture network traffic and analyze.
8. Create a simple keylogger using Python
9. Footprinting a Target using Maltego
10. Installing the Kali Linux live OS in pendrive to bypass the Windows 10 OS.
11. VULNERABILITY ANALYSIS - CGI Scanning with Nikto

TOTAL HOURS –60

REFERENCES:

1. Stuart McClure, Joel Scambray, George Kurtz "Hacking Exposed 7: Network Security Secrets & Solutions", Seventh Edition, McGraw Hill Professional 2012
2. <https://www.hackingloops.com/introductory-guide-to-osint/>
3. <https://www.hacking-tutorial.com/tips-and-trick/information-gathering-using-theharvester-in-kali-linux/>
4. <https://www.varonis.com/blog/how-to-use-wireshark>

COURSE OUTCOMES:

CO1:To Gather the information on various subdomains, email address, virtual host on online.

CO2:To work on various simple commands to gather network, server and domain related information.

CO3:Able to extract the network traffic information using wireshark.

CO4:To implement the key logger tools from scratch.

CO5:Learn to bypass the system and website and access it data.

Board of Studies (BoS) :

17thBOS was held on 01.06.2022

Academic Council:

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		M													
CO2				L		M					L				
CO3								M							
CO4							L								
CO5			L										H		

SDG No. & Short Description

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement : By learning Ethical Hacking, the student can work, develop and deploy various cyber security tools, aware of various threats around and protect from them.

TECHNOLOGY CORE COURSES (SEMESTER V)

CADX 105	COMPUTER FORENSICS AND	L	T	P	C
	INVESTIGATION				
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the fundamentals of computer forensics.

COB2: Explore on the data acquisition techniques for digital evidence.

COB3: Study how to process crime and incident scenes.

COB4: Learn forensics analysis and validation techniques.

COB5: Gain knowledge on the Forensics tools in real time applications.

MODULE I	INTRODUCTION	9
Overview of Digital Forensics – Digital Investigations – Professional Conduct – Digital Forensics Investigation – Private Sector High Tech Investigations – Data Recovery Workstations and Software – Conducting an Investigation.		
MODULE II	DATA ACQUISITION	8
Storage Formats for Digital Evidence – Best Acquisition Method – Contingency Planning for Image Acquisitions – Acquisition Tools – Validating Data Acquisition – RAID Data Acquisitions.		
MODULE III	PROCESSING CRIME AND INCIDENT SCENE	10
Identifying Digital Evidence – Collecting Evidence – Processing Law Enforcement Crime Scenes – Preparing for a Search – Securing a Digital Incident or Crime Scene - Seizing Digital Evidence at the Scene – Storing Digital Evidence – Obtaining a Digital Hash – Working with Windows and CLI Systems.		
MODULE IV	FORENSICS ANALYSIS	9
Data Collection and Analysis – Validating Forensics Data – Addressing Data Hiding Techniques – Expert Testimony in Digital Investigations - Mobile Device Forensics – Network Forensics - Email and Social Media Investigations.		
MODULE V	TOOLS AND CASE STUDIES	9
Digital Forensics Tools - Hardware and Software Tools – Validating and Testing Forensics Software – Report Writing for High_Tech Investigations - Email Forensics Tools - Role of Digital Forensics in Real Time Applications.		
L – 45; TOTAL HOURS – 45		

TEXT BOOKS:

1. Bill Nelson, Amelia Philips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition, Cengage Learning, 2016.

REFERENCES:

2. David Lilburn Watson, Andrew Jones, Digital Forensics Processing and Procedures, Syngress, 2013.
3. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, British Library Cataloguing-in-Publication Data, 2011.
4. Greg Gogolin, Digital Forensics Explained, CRC Press, 2013.

COURSE OUTCOMES:

CO1: Apply Computer Forensic concepts and procedures in Investigation.

CO2: Select the appropriatedata acquisition techniques for investigations.

CO3: Illustrate the need of Process crime and Incident scenes for digital evidence.

CO4: Analyze various validation techniques of forensics data.

CO5: Demonstrate various forensic tools to investigate the cybercrime and identify the digital pieces of evidence.

Board of Studies (BoS)

19THBoS was held on 13.2.23

Academic Council

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		H												
CO2		L	M		H									
CO3			H											
CO4					H								H	
CO5					H		H						H	H

Note: L- Low Correlation M –Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The course outcomes are measurable and help the learners to efficiently perform the computer forensics Investigation in data recovery methods, digital forensics analysis and validation. Also it enables the learners to apply the forensics tools for various digital and device Investigations in real time applications.

CADX 106	MACHINE LEARNING ALGORITHMS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basic concept of machine Learning Technique.

COB2: Learn the supervised learning algorithms and its applications.

COB3: Provide an overview of unsupervised classifiers.

COB4: Use tools for supervised and unsupervised algorithms.

COB5: Experiment with real-life applications.

MODULE I INTRODUCTION 9

Basics of Machine Learning – Types of Machine Learning techniques: Supervised Learning, Unsupervised Learning & Semi Supervised Learning – Labelled and Unlabelled data - Overview of Optimization-Training and Testing data – Bias-Variance.

MODULE II SUPERVISED LEARNING 9

Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression – Naive Bayes – Support vector machine - Decision Tree - Random forests.

MODULE III UNSUPERVISED LEARNING 9

Working of Unsupervised Machine Learning Algorithm – Clustering: K-Means Clustering, Principal Component Analysis, Linear Discriminant Analysis - Unsupervised Classifiers: KNN, Mini-Batch K-Means.

MODULE IV SOFTWARE TOOLS FOR MACHINE LEARNING 9

Overview of Machine Learning Tools: PyTorch/Weka/Tensorflow/Keras - Implementation of Regression - Support Vector Machine - K-Means Clustering - Principal Component Analysis - Linear Discriminant Analysis - Neural Networks algorithms.

MODULE V APPLICATIONS & USE CASES 9

Use cases of Machine Learning -Implementation in Various Industry Domains: Medical Diseases analysis, Web Content Classification, Speech Recognition - Machine learning in Business Applications: E-Commerce, Healthcare, Agriculture, Education sector and Human Resource.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Oliver Theobald, Machine Learning for Absolute Beginners, Third Edition, 2021.
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer Publication, 2010.

REFERENCES:

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Prentice Hall of India, 3rd Edition 2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, Foundations of Machine Learning, MIT Press, 2012.
3. Stephen Marsland, Machine learning - An Algorithmic Perspective, Second Edition, 2015.

COURSE OUTCOMES:

CO1: Understand the basic concepts of machine learning

CO2: Design and evaluate supervised machine learning algorithms.

CO3: Provide the knowledge about clustering methods.

CO4: Demonstrate a very broad collection of various machine learning tools.

CO5: Develop techniques and tools for improving real-time application developments.

Board of Studies (BoS) :

19th BoS held on 13.02.2023

Academic Council:

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1														
CO2			L											
CO3			M											
CO4		H			H									H
CO5	L					M								H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Course Outcomes have achieved the Curricula need and Learner would acquire complex problem solving skills with critical thinking ability. The learner will be able to use all opportunities and to apply the acquired knowledge in everyday situations to promote sustainable development.

CADX 107	GAMES , ARTS AND DESIGN	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the different types of games and navigations.

COB2: Learn

creative and competent to work with 2D Character and vector graphics.

COB3: Familiarize about

storyboards, paper prototype of your game and game design document.

COB4: Learn to work in a challenging work environment and solve complex problems related to the field of the study.

COB5: Study and integrate the different UI patterns.

MODULE I INTRODUCTION TO GAME PROGRAMMING**9**

Overview of Game programming - History of Games - Game Engine Architecture: Engine Support - Resource Management - Real Time Game Architecture - Game development - Types of game and use cases: FPS – RPG – Racing – Fighting – Spinner – Casino - Game Simulations: Multiplayer Online (MMO) - Adventure - Real Time Strategy (RTS) - Puzzle, Action - Stealth Shooter - Combat.

MODULE II PRINCIPLES BEHIND GAMES & ARTS DESIGN**9**

Multidimensional characters-Different Countries characters and Styles Asian characters vs. Western characters - Making sprites - Working with vector graphics - The market - The audience - Game publishing platforms- The competitor - Define the story - Create timelines – Storyboards - Game play mechanics - Costs of the game - Creation of game design document

MODULE III GAME DESIGN DEVELOPMENT**9**

Multidimensional Game Design - Stages of Game development: Planning - Production – Testing - Launch- Graphic - sound design - Game design use cases : Project creation – Camera - Shaders – Materials - Game controller - Moving Background - Base classes – Player - Miscellaneous objects - User interface.

MODULE IV MULTIDIMENSIONAL DRAWING AND PAINTING**9**

2D environment-Form–Shape - Anatomy- Proportions – Slicing - Tile map - Breaking Down Color - Lighting- Shading- 2D background-

Form and Shape - Anatomy and Proportions - Perspective -
 Breaking Down Color - Lighting and Shading - 2D Character Design: Frame-
 by-frame, cut out, skeletal, lighting, shadows - Primitives – Textures -
 creating face – expressions – anatomy - body parts - cartoon making.

MODULE V APPLICATIONS

9

Applications: Paint – Image Manipulation – Autodesk - Sketchbook- GIMP
 - Paint.NET- Pixel Art Graphics Packages- Vector Graphics Packages.
 Case study – Games - Success rates - Compilation - Oblivion – Far Cry 3- Mortal
 Kombat X - Fight of the legends - 2D Platformer – Build with assets - Biker-
 CS Connect- Gardern Gates- Roebuck.

TOTAL HOURS –45

TEXT BOOKS:

1. Adams, "Fundamentals of Game Design", Third edition, New Riders
 Publication, 2015.

REFERENCES:

1. Chris Solarski, "Drawing Basics and Video Game Art : Classic to
 Cutting-Edge Art Techniques for Winning Video Game
 Design", First Edition, Watson – Gupta Publication, 2012.
2. Alan Thorn, "Introduction to Game Programming with C++",
 BPB Publications, First Edition, 2007.

COURSE OUTCOMES:

CO1: Recognize any Gaming Project with the different gaming components.

CO2: Explore the workflow of multidimensional game design.

CO3: Develop game publishing and game testing.

CO4: Build Multidimensional environment for Designing and Sketching
 multidimensional Characters.

Board of Studies (BoS):

19th BOS was held on 13.02.2023

Academic Council:

20th meeting of AC held on
 13.4.23.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1		M				L								
CO2				L					L					
CO3								M						
CO4	L		H		M									
CO5		M			M	H	H			H	M	H	H	

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The Games, Arts and Design help the learners to design games for multiple genres and detailed understanding of the game economy.

CADX108	CLOUD SERVICE FOR DATA SCIENCE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basic concepts of cloud services.

COB2: Impart the knowledge of manage the cloud services.

COB3: Learn the various cloud service providers.

COB4: Provide the necessary training for functionalities of cloud tools.

COB5: Learn the real-life applications of cloud deployment.

MODULE I INTRODUCTION 9

Overview of Cloud–Types of Deployment Models - Public, Private, Hybrid and Multi-Clouds -Services of Cloud - IaaS – PaaS – SaaS - Storage as a Services – Adoption of Cloud Services –Features and Benefits of Cloud Services.

MODULE II MANAGING CLOUDSERVICES 9

Understanding Workloads - Workload Use Cases - Analytics workload and Batch workloads - Principles of Workload Management - Workload Management in a Hybrid Cloud - Connecting Workloads in the Cloud -Importance of API, Standard workload layer and Portability - Managing and Monitoring Workloads - Tracking workloads.

MODULE III CLOUD SERVICE PROVIDERS 9

Overview of Cloud Providers - Microsoft Azure: - Fundamental Concept, Architectural Components, Database, Analytics – AWS: - Fundamentals, Architecture and Frameworks – GCP: - Fundamentals, Core Infrastructure.

MODULE IV CLOUD TOOLS 9

AWS Machine Learning Tools - AWSEMR - Amazon Glue - AWS SageMaker – Azure Weka – XGBoost.

MODULE V APPLICATIONS AND CASE STUDYS 9

Amazon EC2 - Amazon S3 - Amazon CloudFront - Dropbox – Microsoft Office 365 - Case Study: Video Streaming Platforms – File hosting services – Secure storage of personal data – Backup Solutions for systems, sites and software – Chatbots.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. S.M. Ibrahem, Rabia Farheen, S.M. Salman. FUNDAMENTALS OF AWS GCP Azure Cloud Technology, Amazon digital services publications, 2022.
2. Hiran, Kamal Kant, Ruchi Doshi, Temitayo Fagbola, and Mehul Mahrishi. Cloud computing: master the concepts, architecture and

applications with real-world examples and case studies. Bpb Publications, 2019.

- Patterson, Scott. Learn AWS Serverless Computing: A Beginner's Guide to Using AWS Lambda, Amazon API Gateway, and Services from Amazon Web Services. Packt Publishing Ltd, 2019.

REFERENCES:

- Hurwitz, Judith, Marcia Kaufman, and Fern Halper. "Cloud services for dummies." USA: IBM Limited Edition (2012).

COURSE OUTCOMES:

CO1: Define the cloud storage requirements for the data analysis.

CO2: Manage various cloud architecture.

CO3: Select the appropriate cloud services providers.

CO4: Use the cloud services providers and tools in different applications scenario.

CO5: Deploy the data science model in cloud environments.

Board of Studies (BoS) :

19thBoS was held on 13.02.2023

Academic Council:

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H													
CO2		H											H	
CO3			M											H
CO4			M											
CO5				H										

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Introduction to Cloud Technology helps the learners to prepare a plan for utilize various cloud services and they can also analysis of case studies and applications when deciding to adopt cloud computing architecture. Furthermore, knows the solutions for management of cloud services and demonstrate cloud-based application

CADX 109	VIRTUALIZATION AND CLOUD	L	T	P	C
SDG: 9	SECURITY	3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basic concepts of Cloud Data Security

COB2: Learn the deployment and management of virtualized servers, deploying desktop, application and network virtualization

COB3: Explore the concepts of risks issues and challenges

COB4: Study the various methods of securing the virtual machines

COB5: Illustrate the skills in securing the server virtualization.

MODULE I INTRODUCTION TO VIRTUALIZATION 9

Fundamentals of virtualization – virtualization architecture – types of Hypervisors – types of threats – vulnerabilities in virtualization platforms – challenges of virtualized environments – vulnerability assessment life cycle – securing Hypervisors – configuring hypervisors.

MODULE II CONCEPTS OF CLOUD SECURITY 9

Cloud computing software security fundamentals – objectives of cloud information security - Confidentiality, Integrity, and Availability – cloud security services – Authentication, Authorization, Auditing and Accountability – cloud security design principles – secure development practices – approaches to cloud software requirements engineering – policy implementation- “KEYCLOAK” – open source authentication and authorization tool.

MODULE III CLOUD SECURITY RISK ISSUES AND CHALLENGES 9

Privacy and compliance risks – PCI DSS – HIPAA – other privacy related acts - Threats to Infrastructure, Data, and Access Control - Cloud Access Control Issues- Cloud Service Provider Risks – CSIRT – Virtualization security management – Hypervisor risks – VM security recommendations – “REDASH”- open source tool for data security

MODULE IV SECURING THE VIRTUAL MACHINE 9

VM threats and vulnerabilities – virtual disk manipulation – VM encryption – key management challenges – VMware tools – VM disk security – VM logging - Locking Down Microsoft VMs - Locking Down XenServer VMs – Logging and

Auditing – “Security Monkey” – Netflix tool to automate the cloud configuration issues

MODULE V VIRTUAL INFRASTRUCTURE SECURITY 9

Virtual Desktop Infrastructure (VDI) - Benefits and Drawbacks - Loss of data and network segmentation – VDI architecture overview - Leveraging VDI for Security-Storage virtualization - Application Virtualization – “OSSEC” and “Snort” – open source Intrusion Detection and Prevention System (IDS, IPS)

TOTAL HOURS – 45

TEXT BOOKS:

1. “Security Guidance for Critical Areas of Focus in Cloud Computing v4.0,” Cloud Security Alliance, July 2017
2. Ronald L. Krutz& Russell Dean Vines, “Cloud Security - A Comprehensive Guide to Secure Cloud Computing”, Wiley, 2016
3. Dave shakleford “Virtualization Security (Protecting virtualized environments)”, wiley, 2014.

REFERENCES:

1. Chris Dotson, Practical Cloud Security: A Guide for Secure Design and Deployment, o’reilly, 2019
2. Joachim R. Winkler, “Securing the Cloud: Cloud Computer Security Techniques and Tactics,Elsevier, 2011.

COURSE OUTCOMES:

CO1:Realize the Virtualization security concepts and threats.

CO2:Build a secured and transparent cloud

CO3:Demonstrate a clear understanding of the basic concepts of Cloud Data Security

CO4:Identify the legal challenges impacting cloud security

CO5:Construct a secured virtual cloud environment

Board of Studies (BoS)

19th BoS was held on 13.2.23

Academic Council

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		M	L	H		L	M	H	L				M	H
CO2			H		H		H	H					H	M
CO3		M		M	H		M	L	M	M				
CO4		H		M	L		L						L	
CO5										H			H	H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9:

Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

The course describes the concepts of securing the virtualized cloud environment. Understanding and applying the security concepts in the virtualized environment make the cloud platform a robust technology which enables the learners to widely use the cloud infrastructure for their business requirements.

CADX 110	XML AND WEB SERVICES	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basic concepts of XML Technology.

COB2: Be exposed to build applications based on XML.

COB3: Understand the architecture and design of the Web Services framework.

COB4: Learn the various web service protocols.

COB5: Gain knowledge about various web service based applications.

MODULE I INTRODUCTION TO XML 9

XML – Benefits – Advantages of XML over HTML –EDL – Databases - XML Syntax - XML document structure – XML Content Models- Rules of XML Structure- Well-formed and valid documents – Namespaces – Read and Process of XML Documents- DTD – XML Schema.

MODULE II BUILDING XML BASED APPLICATIONS 9

Parsing XML Using Document Object Model - Parsing XML Using SAX– XML Presentation Technologies –XSL – XFORMS – XHTML – Voice XML – Transformation Technologies –XSLT – XLINK – XQuery – X-Files – XPATH – XPointer – IntegratingXML with Databases.

MODULE III WEB SERVICES ARCHITECTURE 9

Business motivations for web services –B2B –B2C- Technical motivations – Limitations of CORBA and DCOM –Service Oriented Architecture (SOA) – Web services Architecture – Implementation Architectural View : Web services technology stack –Logical Architectural View: Composition of web services –Deployment Architectural View: From Application Servers to Peer-to-Peer– Process Architectural View - Life in the Runtime.

MODULE IV WEB SERVICES BUILDING BLOCKS 9

Transport protocols for web services –Messaging with web services –Protocols – SOAP–Describing web services –WSDL –Anatomy of WSDL –Manipulating WSDL – Web service policy –Discovering web services –UDDI –Anatomy of UDDI- Web service inspection –Ad-Hoc Discovery –Securing web services.

MODULE V E-BUSINESS APPLICATIONS 9

B2B - B2C Applications –Different types of B2B interaction –Components of e-business XMLsystems –ebXML –Rosetta Net Applied XML in vertical industry –Web services for mobile devices - XML and Web service tools and real time web applications – Case studies.

TOTAL HOURS – 45**TEXT BOOKS:**

1. Richards, Robert. "Pro PHP XML and Web Services", United States, Apress, 2016.
2. Frank P. Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002.

REFERENCES:

1. Blokdyk, Gerardus. Java API for XML Web Services Complete Self-Assessment Guide. N.p., Emereo Pty Limited, 2018.
2. Ron schmelzer et al, "XML and Web Services", Pearson Education, 2002.
3. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2004.
4. Evjen, Bill. Professional xml. John Wiley & Sons, 2008.

COURSE OUTCOMES:

CO1: Create and process XML document using DTD and Schema.

CO2: Validate the XML documents using presentation and transformation technologies.

CO3: Build SOA-based applications for intra-enterprise and inter-enterprise applications.

CO4: Develop web services integrating technology components.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1						M					L	L			L
CO2		L		L	M				L					L	
CO3			M		L			M	L	L		M		L	
CO4					M	L		L						L	L
CO5		L	L		H	L		L	L						L

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9:Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

In the course, concepts and technologies for business applications were covered. The student will be able to create, deploy, and accurately make decisions for future industrial and infrastructure projects by recognizing the concepts and working with different standards and protocols.

CADX 111	PRINCIPLES OF VIRTUALIZATION	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Provide the basic knowledge of virtualization and various types of virtualizations.

COB2: Understand the functions of virtualization in cloud infrastructure

COB3: Explore the implementation and usage of VMWare Virtualization, its installation process and the working of Windows virtual PC.

COB4: Understand and hands on using of various Virtualization software.

COB5: Apply skills and working with different case studies using virtualization

MODULE I INTRODUCTION 9

Basics- Need- Virtualization Technologies- Types of Virtualizations: Server Virtualization, Storage Virtualization, I/O Virtualization, Network Virtualization, Client Virtualization, Application virtualization, Desktop virtualization- Uses of Virtualization- Server Consolidation.

MODULE II CLOUD RESOURCE VIRTUALIZATION 9

Virtualization as foundation of cloud-understanding hypervisors: Type 1 and Type 2 hypervisor-Understanding machine images and instances-Managing Instances-Virtual machine Provisioning and server migrations- Cloud Providers- Disaster Recovery.

MODULE III DESKTOP VIRTUALIZATION ENVIRONMENT 9

BIOS Configuration to support hardware virtualization- Install and configure Windows Virtual PC: installing Windows Virtual PC on various platforms (32-bit, 64-bit), creating and managing virtual hard disks, configuring virtual machine resources, including network resources, preparing host machines: create, deploy and maintain images.

MODULE IV VIRTUALIZATION TOOLS 9

Vmware- Vsphere, ESXI - vCenter Server - Oracle Virtual box: Creating Virtual Machine, Microsoft hyper-v: Create Virtual Machines. Create hyper-v virtual networking, Use virtual Machine Snapshots.

MODULE V CASE STUDIES**9**

Server Migration to Virtual Machine - Xen- Innovative health care solution using VDI-
Implementation of SAN in Educational Institute Network.

L –45 ; TOTAL HOURS –45**TEXT BOOKS:**

1. Nelson Ruest, Danielle Ruest, Virtualization, A beginners guide, 2009, MGH.
2. Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka Menken, Gerard Blokdijk, Lightning SourceIncorporated,2008

REFERENCES:

1. Wan Grotenhuis, Rogier,Dittner Virtualization with Microsoft Virtual Server,2005.
2. Aaron Tiensivu, Ken Majors, Geoffrey Green, David Rule, Andy Jones,MatthijsteSeldam, SyngressPublications,2006.
3. Virtualization: From the Desktop to the Enterprise, Chris Wolf, ErickM.Halter, EBook,2005

COURSE OUTCOMES: On completion of this course, students will

CO1: Enumerate the basic concepts of Virtualization.

CO2: Categorize the process of virtualization in cloud infrastructure.

CO3: Analyze an enterprise desktop virtualization environment

CO4: Practice the various virtualization software.

CO5: Implement various test strategies in Virtualization.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			L											
CO2			M		H									
CO3				H	M									
CO4		H												H
CO5	L					M	M							H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

Board of Studies (BoS) :

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held
on 13.4.23.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Principles of Virtualization can help in lot of ways; lets you create useful IT services using resources that are traditionally bound to hardware. It allows you to use a physical machine's full capacity by distributing its capabilities among many users or environments.

CADX 113	TIME SERIES ANALYSIS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basic concepts of time series analysis.

COB2: Know the important characteristics of Stationary Data and Non Stationary Data

COB3: Study the different time series models

COB4: Define and formulate the real life problems using time series models.

COB5: Use R and Python to estimate the models

MODULE I INTRODUCTION 9

Definition – Objectives – Examples – Types of Time Series – Time-series components: Seasonal, Cyclic and Irregular Variations – Estimation and Elimination of Trend and Seasonal Components – Autocorrelation – Autocovariance – Linear Regression – Areas of Applications for time series analysis.

MODULE II Time Series Analysis 9

Decomposition of Time Series – Stationary Data – Test for Stationarity: Rolling Statistics, Augmented Dickey Fuller Test – Convert Non Stationary Data to Stationary Data: Differencing, Transformation, Moving Average – Correlation: ACF and PACF.

MODULE III Time series Models 9

Moving average models – ARMA model – Additive time series model – Multiplicative time series model – ARIMA models – Box Jenkins multivariate models – Holt winters exponential smoothing (single, double and triple) model.

MODULE IV R for Time Series Analysis 9

Reading Time Series Data – Plotting Time Series – Decomposing Time Series: Decomposing Seasonal and Non-Seasonal Data, Seasonally Adjusting – Plotting the ACF and PACF – Forecasts using Moving Average – Exponential Smoothing and ARIMA Model.

MODULE V Python for Time Series Analysis**9**

Import Time Series – Visualize Time Series – Seasonal Plot of a Time Series – Patterns in a Time Series – Decompose a Time Series – Detrend a Time Series – Deseasonalize a Time Series – Test for seasonality of a Time Series – Compute Autocorrelation Function – Forecastability of a Time Series: Moving Average, Exponential Smoothing and ARIMA Model.

L – 45; TOTAL HOURS –45**TEXT BOOKS:**

1. Shumway and Stoffer, “Time Series Analysis and its Applications with R examples”, Third edition, 2016.
2. C. Chatfield: The Analysis of Time Series - An Introduction Chapman and Hall, 2009.

REFERENCES:

1. G.E.P. Box, G.M. Jenkins and G.C. Reinsel: Time Series Analysis, Forecasting and Control, John Wiley & Sons Publications 2008.
2. P.J. Brockwell .and R.A. Davis: Time Series: Theory and Methods, SpringerVerlag.
3. Time Series Forecasting in Python by Marco Peixeiro Released October 2022, Manning Publications.

COURSE OUTCOMES:**CO1:**Analyze the given problem with time series data.**CO2:**identify and select the important parameters for the proposed model.**CO3:** Design the appropriate model and forecast.**CO4:** Apply R/Python to estimate the models.**CO5:** Interpret the analysis with insights.**Board of Studies (BoS) :**19thBoS was held on 13.02.2023**Academic Council:**20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		H					M		M					
CO2		H							M					
CO3			H										H	H
CO4					H	H								
CO5				H										

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9:

Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

This course will motivate the student to use different time series models for analyzing larger and more complex data in forecasting various real time applications / industries or sectors.

CADX114	SPECIALIZATION IN 3D PRODUCTION	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basics of animation.

COB2: Familiarise with different object types and approaches.

COB3: Describe the basic materials required for creating a scene.

COB4: Illustrate various rendering options and tools available for 3D animation.

COB5: Study various use cases and real-time applications.

MODULE I INTRODUCTION TO 3D MAX 9

Overview of 3D Max-3D Max applications-Difference between 2D and 3D – Installation procedures of Autodesk-3D Max interface elements-Command panel-viewports- Selecting objects- Displaying objects- Transforming objects

MODULE II MODELING 9

Setting up work environment- Working with shapes and splines - meshes - polys- Modeling features - Sub-object modes- Creating Lofts- Creating Booleans- Creating terrain- Creating scatter objects- Critical Modelling Modifiers

MODULE III OBJECT ANIMATIONS 9

Material Editor- icons- rollouts - Blinn Basic Parameters rollout- Extended Parameters rollout- Super Sampling rollout- Critical Map Channels- Critical Map Types- UVW Mapping - Basic Lighting- Photometric Lighting- Global Illumination- Camera Basics- Animation Basics- Animation Controllers.

MODULE IV RENDERING 9

Render Scene dialog box- Email Notifications- Renderer tab- Choosing file dimensions- Additional rendering tools Scene Assembly- Computer power vs. scene complexity- Assembly tools - Effect Basics - Atmospheric effects- Render effects- Multi-pass effects.

MODULE V CASE STUDY 9

Exploring the Production workflow for 3D animation - Understanding the entire workflow involved in the Production process - Apply the process for the group project making movie - Finalizing sound – Effects – 3D Virtual Reality – Rendering - Making video CD -Flowing River Animation

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Autodesk 3Ds Max Fundamentals, Ascent, ISBN: 9781630574246, 2022
2. Lukas Dubeda, 3Ds Max 2010 Architectural Visualization - Advanced to expert, 2009.
3. Kelly L. Murdock, 3Ds Max 2010 Bible Author PublisherWiley,2008

REFERENCES:

1. Kelly L. Murdock, "Autodesk Maya 2023 Basics Guide", SDC publications, ISBN-13: 9781630575274, 2022.

COURSE OUTCOMES:

CO1: Demonstrate the controls required to create an animation.

CO2: Apply the modeling techniques and construct a model for real-time scenarios.

CO3: Create and exhibit ananimation scene with light effects and shadows.

CO4: Model and implement the fine-tuned scenes using animation tools.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20thmeeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M		M		M								H		
CO2		L	M		L									L	
CO3			L		L						L		H	M	
CO4		L	M		M										
CO5	H				L									M	

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Learners can create and animate a scene with appropriate techniques. Also, give life to an object that is yet to come into existence.

CADX 129	INFORMATION SECURITY FUNDAMENTALS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the fundamentals of security its components and life cycle.

COB2: Analyze the need for security in Business and IT.

COB3: Classify the security measures for network infrastructure.

COB4: Assess the risk and security metrics and plan for risk management.

COB5: Understand the need of Performing Asset Classification and Declassification, Retention and Disposal of Information Asset.

MODULE I INTRODUCTION TO INFORMATION SECURITY 09

Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System; Balancing Information Security and Access; Implementing IT Security, The system Development Life cycle, Security professional in the organization.

MODULE II THE NEED FOR IT SECURITY 09

Business Needs-Protecting the functionality, Enabling the safe operations, Protecting the data, safe guarding the technology assets; Threats-compromises to Intellectual property, deliberate software attacks, Espionage and trespass, sabotage and vandalism; Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering.

MODULE III NETWORK INFRASTRUCTURE SECURITY AND CONNECTIVITY 09

Understanding Infrastructure Security- Device Based Security, Media-Based Security, Monitoring and Diagnosing; Monitoring Network- Firewall, Intrusion Detection System, Intrusion Prevention system; OS and Network Hardening, Application Hardening; Physical and Network Security- Policies, Standards and Guidelines.

MODULE IV IT RISK ANALYSIS, RISK MANAGEMENT AND SECURITY METRICS 09

Major steps of IT risk analysis - probability, impact, and prioritization. Approaches to managing security risks - reduction, mitigation transfer, and acceptance. Managing risk with metrics. Identity Access Management, Security incident, response planning, Business Continuity Planning after a security incident.

MODULE V INFORMATION ASSET CLASSIFICATION AND RECENT CHALLENGES 09

Classification of Information, Information Assets, Declassification, Retention and Disposal of Information Assets. Recent challenges in - cyber security, internet security. Case studies on – Ransomware, Data Breaches, Malware, Compromised Passwords.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Foundations of Information Security A Straightforward Introduction, No Starch Press (October 7, 2019), ISBN-10 : 1718500041
2. Cryptography and Network Security Principles and Practices, by William Stallings, Pearson Education; Seventh edition (30 June 2017)
3. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 6th edition (2017)
4. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
5. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerba, 2012.

REFERENCES:

1. Elementary Information Security, Jones & Bartlett Learning; 3rd edition (October 28, 2019)
2. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – by Deven N. Shah, Wiley.
3. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 2nd edition.

COURSE OUTCOMES:

CO1: Understand the fundamentals of security.

CO2: Interpret the need for IT security.

CO3: Apply the security measures in a network infrastructure.

CO4: Explore the risks involved in an IT environment.

CO5: Infer about information asset classification and real time case studies.

Board of Studies (BoS) :

16thBoS of CA held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M						L		L					L	
CO2						H									
CO3	L						M	H					L		
CO4							H		M					L	
CO5									M				M		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Industry, Innovation & Infrastructure

Statement: The understanding of concepts related to risks and vulnerabilities in information security along with familiarization of various levels of security policies and authorization levels in a real time scenario.

CADX 123	INTRODUCTION TO DEEP LEARNING	L	T	P	C
SDG: 3		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the basic concept of neural networks and deep learning.

COB2: Provide insights about convolution neural network.

COB3: Study the pre-trained models and transfer learning.

COB4: Gain knowledge on sequence modeling and recurrent nets.

COB5: Familiarize with essential tools and frameworks to implement for various real-world applications.

MODULE I INTRODUCTION**9**

Fundamentals of Deep Learning: Neural Networks - Human Biological Neural Network Vs Artificial Neural networks - Perceptron - Feed Forward and Back Propagation Learning - Architecture of Neural Networks – Key Features - Limitations of Neural Networks.

MODULE II CONVOLUTIONAL NEURAL NETWORK**9**

Basic Concept - Convolution Operation - Feature Matrix - Building Blocks of CNN: Convolutional Layers - Filters - Pooling: Types– Stride- Padding-Activation Functions- Dense Layers– Dropout - Output Layers- Optimization: Stochastic Gradient Descent (SGD) – Adam Optimizer.

MODULE III PRE-TRAINED MODELS AND TRANSFER LEARNING**9**

Pre-Trained Models: Self-Supervised -AlexNet -VGGNet- GoogleNet- ResNet- Transfer Learning Techniques: Working Process – Build Base Model- Feature Extractors- Fine-Tuning- Freeze Layers.

MODULE IV SEQUENCE MODELLING AND RECURRENT NETS**9**

Recurrent Neural Network: Sequential Data Processing with Recurrent Layers- Bidirectional RNNs- Encoder-Decoder Sequence to Sequence Architecture- Limitations - Long Short Term Memory Networks (LSTM) – Classification - Debugging - Issues -Applications.

MODULE V TOOLS AND CASE STUDIES**9**

Deep Learning Frameworks: TensorFlow- Pytorch - Keras- Case Studies: Agriculture - Fisheries - Object Detection-Opinion Mining - Healthcare- Image Segmentation-Dialogue Generation.

L – 45; TOTAL HOURS - 45**TEXT BOOKS:**

1. Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.
2. Umberto Michelucci, Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018.
3. Paul Fergus Carl Chalmers, “Applied Deep Learning: Tools, Techniques and Implementation”, Springer International Publishing AG, 2022.

REFERENCES:

1. Ian Good Fellow, Yoshua Bengio and Araon Courville, “Deep Learning”, MIT Press, 2017.
2. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, “Dive into Deep Learning”, Amazon Senior Scientists- Open Source and Free Book, March 2022.
3. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2017.

COURSE OUTCOMES:

CO1: Apply foundational concepts to develop, train, and evaluate simple neural network models.

CO2: Implement convolution neural networks (CNNs) for classification problem in real-world scenarios.

CO3: Select the appropriate pre-trained models for object detection.

CO4: Apply sequence modeling techniques in deep learning frameworks.

CO5: Demonstrate and apply deep learning models in real-time problem solving environment.

Board of Studies (BoS):

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2
CO1	M													
CO2	M	H	L										L	
CO3			H											M
CO4					M				M				M	
CO5					H	M							H	

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SGD 3:

Industry, Innovation and Infrastructure – To build sustainable industries, support Innovations, and improve infrastructure.

Statement:

This course covered the fundamentals of deep learning. By gaining an understanding of the prominent concepts, various models and architectures of deep learning, students will be motivated to implement deep learning-based solutions in real-world scenarios. The skills and knowledge acquired through this course will help students to meet the demand for deep learning expertise in industry.

CADX 124	COMPUTER VISION	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Explore the basic concepts of Computer Vision.

COB2: Expertise in image processing and segmentation techniques.

COB3: Provide feature extraction techniques for image recognition and classifications.

COB4: Excel proficiency in 3D computer vision.

COB5: Impart computer vision tools through hands on real- world applications.

MODULE I INTRODUCTION 9

Overview - Definition - Scope - Applications – Milestones- Image – Types - Representation and Processing - Color Spaces and Image Formation – Sampling and Quantization - Image Filtering Techniques.

MODULE II IMAGE PROCESSING AND SEGMENTATION 9

Image Transformation: Geometric Transformations (Translation- Rotation- Scaling) - Image Filtering: Convolution and Correlation-Frequency Domain Filtering. Image Segmentation: Types of Image Segmentation – Color-Based Segmentation- Morphological Operations- Clustering Techniques.

MODULE III FEATURE EXTRACTION AND DETECTION 9

Definition -Features – Text and Color - Role of Features in Image and Video Analysis - Feature Extraction Techniques: HOG-SIFT- LBP- GLCM - Feature Detection: Edge and Corner Detection - Blob Detection

MODULE IV 3D COMPUTER VISION 9

Methods for 3D Vision: Depth Perception - Projection Schemes - Shape from Shading - Stereo Vision - Time of Flight Cameras - 3D Object Recognition – 3D Reconstruction - Basics of Simultaneous Localization and Mapping (SLAM).

MODULE V TOOLS AND CASE STUDIES 9

Computer vision Tools: OpenCV - Scikit image - Tensorflow - Pytorch. Case study: Facial recognition- Object Detection- Medical Image processing, Sports analytics, Agriculture Smart Detection Wheat Rust, Augmented Reality (AR).

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Szeliski, Richard. Computer vision: algorithms and applications. Springer Nature, 2022.

2. Ayyadevara, V. Kishore, and Yeshwanth Reddy, "Modern Computer Vision with PyTorch: Explore deep learning concepts and implement over 50 real-world image applications" Packet Publishing Ltd, 2020.
3. Davies, E. Roy. Computer and machine vision: theory, algorithms, practicalities. Academic Press, 2012.

REFERENCES:

1. D. L. Baggio et al., —Mastering OpenCV with Practical Computer Vision Projects, Packt Publishing, 2012.
2. E. R. Davies, —Computer & Machine VisionII, Fourth Edition, Academic Press, 2012.
3. Jan Erik Solem, —Programming Computer Vision with Python: Tools and algorithms for analyzing images, O'Reilly Media, 2012.
4. Mark Nixon and Alberto S. Aquado, —Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
5. Simon J. D. Prince, —Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.

COURSE OUTCOMES:

CO1: Comprehend the fundamental concepts in computer vision.

CO2: Analyze and segment the images for diverse applications.

CO3: Extract meaningful information from images and apply recognition algorithms.

CO4: Demonstrate knowledge on 3D vision.

CO5: Investigate and draw inferences by processing images in real time applications.

Board of Studies (BoS):

Academic Council:

20th BoS of CA held on 17.05.2024

22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					M		M							
CO2	H		H										M	
CO3				M							M			
CO4	H				H									
CO5					M	M	M				M			

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG No.9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The learners will be able to implement and evaluate the various innovative computer vision techniques for real time applications.

CADX 125	NATURAL LANGUAGE PROCESSING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the fundamentals of natural language processing.

COB2: Study the word level analysis methods.

COB3: Explore the syntactic analysis concepts.

COB4: Understand the semantics and pragmatics.

COB5: Learn to analyze discourses and Lexical Resources.

MODULE I FUNDAMENTALS of NLP 9

Introduction - NLP in the Real World –Components - Conversational Agents – NLP Pipeline – Data Acquisition – Text Extraction and Cleanup – Pre-Processing - Feature Engineering– Challenges in NLP.

MODULE II TEXT REPRESENTATION 9

Basic Concepts – Vector Space Models – Distributed Representations –Regular Expressions –Finite State Automata - Tokenization -Word Normalization - Lemmatization and Stemming – Natural Language Tool Kit.

MODULE III TEXT CLASSIFICATION 9

Fundamentals – Text Classification Pipeline - Naive Bayes Classifier - Logistic Regression - Support Vector Machine - Neural Embedding in Text Classification - Word Embedding - Document Embedding– Convolutional Neural Networks for Text Classification – Long Short Term Memory for Text Classification.

MODULE IV SYNTACTIC & SEMANTIC ANALYSIS 9

Context-Free Grammars-Grammar rules for English - Normal Forms for Grammar –Part-of-Speech Tagging (POS)- Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Probabilistic CFG- Lexical Semantics -Semantic Analysis – Types – Working Principles - Techniques – Applications.

MODULE V TOOLS AND APPLICATIONS 9

Tools: Genism-NLTK-TextBlob-Regex- Case studies: Information Retrieval System-E-mail Filtering System-Social Media Monitoring - Sentiment Analysis – Language Translation – Text Categorization - Medical Text Analysis – Question Answering System.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Daniel Jurafsky & James H. Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech, Recognition", 3rd edition, 2023
2. SowmyaVajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana, "Practical Natural Language Processing A Comprehensive Guide to Building Real-World NLP Systems" O'Reilly Media, Inc., USA, June 2020.

REFERENCES:

1. Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, Inc.USA, 2009
2. Breck Baldwin, "Language Processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015.

COURSE OUTCOMES:

CO1: Tag a given text with basic Language features

CO2: Implement a rule based system to tackle morphology/syntax of a language

CO3: Design a tag set to be used for statistical processing for real-time applications.

CO4: Compare and contrast the use of different statistical approaches for different types of NLP applications.

CO5: Use tools to process natural language and design innovative NLP applications.

Board of Studies (BoS) :

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO 2
CO1		M	L	H		L	M	H	L				M	H
CO2			H		H		H	H					H	M
CO3		M		M	H		M	L	M	M				
CO4		H		M	L		L						L	
CO5										H			H	H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9:

Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

The course describes the concepts of securing the virtualized cloud environment. Understanding and applying the security concepts in the virtualized environment

make the cloud platform a robust technology which enables the learners to widely use the cloud infrastructure for their business requirements.

CADX 129	INFORMATION SECURITY	L	T	P	C
SDG: 9	FUNDAMENTALS	3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the fundamentals of security components and lifecycle.

COB2: Analyze the need for security in Business and IT.

COB3: Classify the security measures for network infrastructure.

COB4: Assess the risk and security metrics and plan for risk management.

COB5: Understand the need of Performing Asset Classification and Declassification, Retention and Disposal of Information Asset.

MODULE I THE NEED FOR IT SECURITY 9

Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System; Balancing Information Security and Access; Implementing IT Security, The system Development Life cycle, Security professional in the organization.

MODULE II IT SECURITY AND TOOLS 9

Business Needs- Protecting the functionality, Enabling the safe operations, Protecting the data, safeguarding the technology assets; Threats-compromises to Intellectual property, deliberate software attacks, Espionage and trespass, sabotage and vandalism; Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering – Tools – Maltego, honeypot.

MODULE III NETWORK INFRASTRUCTURE SECURITY 9

Understanding Infrastructure Security - Device Based Security, Media-Based Security, Monitoring and Diagnosing; Monitoring Network- Firewall, Intrusion Detection System, Intrusion Prevention system; OS and Network Hardening, Application Hardening; Physical and Network Security- Policies, Standards and Guidelines – Wired and Wireless security.

MODULE IV IT RISK ANALYSIS, RISK MANAGEMENT AND SECURITY METRICS 9

Major steps of IT risk analysis-probability, impact, and prioritization. Approaches to managing security risks - reduction, secure mitigation transfer, and acceptance. Managing risk with metrics. Identity Access Management, Security incident, response planning, Business Continuity planning after a security incident.

MODULE V ASSET CLASSIFICATION AND RECENT CHALLENGES 9

Classification of Information, Information Assets, Declassification, Retention and Disposal of Information Assets. Recent challenges in-Cyber security, Internet security. Case studies on – Ransomware, Data Breaches, Malware, Password cracking.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Foundations of Information Security A Straight forward Introduction, No Starch Press (October 7, 2019), ISBN-10:1718500041.
2. Cryptography and Network Security Principles and Practices, by William Stallings, Pearson Education; Seventh edition (30 June 2017)
3. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 6th edition (2017).
4. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
5. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerba, 2012.

REFERENCES:

1. Elementary Information Security, Jones & Bartlett Learning; 3rd edition (October 28, 2019).
2. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – by Deven N. Shah, Wiley.
3. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 2nd edition.

COURSE OUTCOMES:

CO1: Understand the fundamentals of security.

CO2: Interpret the need for IT security.

CO3: Apply the security measures in a network infrastructure.

CO4: Explore the risks involved in an IT environment.

CO5: Infer about information asset classification and real time case studies.

Board of Studies (BoS) :

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M						L		L					L	
CO2						H									
CO3	L						M	H					L		
CO4							H		M					L	
CO5									M				M		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The holistic understanding of building Applications and components leads to new innovations in the IT Industry.

CADX 130	BLOCKCHAIN TECHNOLOGY	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the basic concepts of Blockchain Technologies.

COB2: Impart knowledge on Blockchain Architecture.

COB3: Understand the fundamentals of cryptocurrency and smart contract.

COB4: Learn the Blockchain implementation frameworks.

COB5: Implementation of Blockchain applications across various industries.

MODULE I INTRODUCTION 9

Basics - History – Uses - Structure of a block - Transactions - Public Ledger- Working principle - accumulation of blocks - pros and cons- tiers of Blockchain technology - features – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem.

MODULE II BLOCKCHAIN ARCHITECTURE 9

Design methodology - Application Templates - Application Development: Ethereum, Solidity, Hyperledger - Business problems - Decentralized Applications: Implementation, Ethereum Dapps - Case studies on Dapps.

MODULE III CRYPTOCURRENCY AND SMART CONTRACTS 9

Cryptocurrency: Basics - Types – Uses- Cryptocurrency Governance - Block: Encryption and Decryption Algorithms – Privacy and Security issues – Exchanges-Smart Contracts: Characteristics - Types - Infrastructure – Supply chain in Blockchain- Smart Contracts in Industry.

MODULE IV BLOCKCHAIN CONSENSUS MECHANISMS 9

Proof of Work (PoW)- Hashcash PoW - Bitcoin PoW - Attacks on PoW - Monopoly problem- Proof of Stake(PoS)- Proof of Burn(PoB) - Proof of Elapsed Time(PoET): Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned and Permissionless models- use cases..

MODULE V APPLICATIONS 9

Blockchain Applications: Banking and Finance, Education, Healthcare, Real-estate, Supply Chain and IoT- Case Studies: Retail, Banking and Financial Services, Healthcare and Utilities.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, "Blockchain Technology" Universities Press (India), 2020.
2. Arshdeep Bahga, Vijay Madiseti, "Blockchain Applications: A Hands On Approach", 2017.

REFERENCES:

1. Kumar Saurabh (Author), Ashutosh Saxena, "Blockchain Technology: Concepts and Applications" Wiley, 2020.
2. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
3. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.
4. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.

COURSE OUTCOMES:

CO1: Recognize the emergence of Blockchain technology models.

CO2: Design the requirement engineering metrics for the system to integrate Blockchain technologies.

CO3: Implement the Bitcoin, cryptocurrencies, and smart contracts in hyperledger.

CO4: Discover permissioned models and the consensus process behind Bitcoin with real-world applications.

CO5: Develop various industries Blockchain applications will allow them to evaluate and utilize this revolutionary technology.

Board of Studies (BoS) :

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1															
CO2				L											
CO3								M			L				
CO4		M				M				L					
CO5													L		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Brief description in two - three lines connecting the course outcomes with the SDG

TECHNOLOGY CORELAB II (SEMESTER V)

CADX 115	COMPUTER FORENSICS AND INVESTIGATION LABORATORY	L	T	P	C
		0	0	4	2

SDG: 9**COURSE OBJECTIVES:**

COB1: Understand Computer forensics Investigation tools for and Kali Linux Commands.

COB2: Learn the live forensic techniques.

COB3: Study the Network and performance analysis tool.

COB4: Explore the E-mail and data extraction tool from image for forensics Investigation.

COB5: Learn the tools for Evidence gathering from various devices and Websites.

PRACTICALS

List of Experiments:

1. Installation and study of commands for password cracking, Network Interface availability using Kali Linux tool.
2. Data recovery techniques for deleted files from pen drive and system files using Forensic tools.
3. Investigate the Live forensics investigation using Autopsy tool.
4. Find last connected USB on your system (USB forensics).
5. Implement the steps for hiding and extracting any text file behind an image file/Audio file using Command Prompt.
6. Study and Implement the steps for installing Wireshark, the packet-sniffing tool for performing Network analysis.
7. Extract Exchangeable image file format (EXIF) Data from Image Files using Exifreader Software.
8. Investigate and perform forensics analysis of E-mail.
9. Extract hidden data from the images using steganalysis tool.
10. Evidence gathering from a Mobile device using forensics tools (Oxygen Forensics Suite).
11. Check the state of the hard drive and recover deleted, fragmented or overwritten files using Autopsy tool.
12. Extracting data from popular websites using forensics tool.

TOTAL HOURS – 60**TEXT BOOKS:**

1. Bill Nelson, Amelia Philips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition, Cengage Learning, 2016.

REFERENCES:

1. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, British Library Catalog using-in-Publication Data, 2011.

COURSE OUTCOMES:

CO1: Illustrate the live investigation and data recovery.

CO2: Use the appropriate tool to Perform the USB forensics, extract hidden data and file extraction.

CO3: Design the steps and use the tools for Network forensics analysis

CO4: Demonstrate extraction of data from Mobile devices and e-mail.

CO5: Apply the forensics tool to extract data from websites and Mobile devices

Board of Studies (BoS) :

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1			M		H		H							H
CO2					H		H							H
CO3					H		H							H
CO4					H		H						H	H
CO5					H		H							H

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: Computer Forensics lab enables the learners to apply various forensics tools to meet the different needs of the case Investigation in real time applications.

CADX116	MACHINE LEARNING ALGORITHMS	L	T	P	C
SDG: 9	LABORATORY	0	0	4	2

COURSE OBJECTIVES:

COB1: Understand the statistics regression and Naive Bayes classifier.

COB2: Explore to implement SVM and decision tree algorithm.

COB3: Make the use clustering techniques and dimensionality reduction.

COB4: Familiar with WEKA, Tensorflow, ScikitLearn, PyTorch tools.

COB5: Gain knowledge to build applications for real-world problems.

PRACTICALS

List of Experiments:

1. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
2. Implement Linear Regression in a given business scenario and comment on its efficiency and performance.
3. Implement SVM algorithm in a given business scenario and comment on its efficiency and performance.
4. Implement Decision Tree algorithm in a given business scenario and comment on its efficiency and performance.
5. Implement Random Forest algorithm in a given business scenario and comment on its efficiency and performance.
6. Explore and Implement K-Means clustering algorithm.
7. Implement PCA in a given business scenario and comment on its efficiency and performance.
8. Implement KNN algorithm in a given business scenario and comment on its efficiency and performance.
9. Demonstrate WEKA tool for implement in a given business scenario and comment on its efficiency and performance.
10. Build a supervised or unsupervised model to implement and compare their performance by using any two tools. (WEKA, Tensorflow, ScikitLearn, PyTorch).

P – 60 ; TOTAL HOURS – 60

TEXT BOOKS:

1. Oliver Theobald, Machine Learning for Absolute Beginners, Third Edition, 2021.
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer Publication, 2010.

REFERENCES:

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
2. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Chapman andHall, CRC Press, Second Edition, 2014.
3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.

COURSE OUTCOMES:

CO1: Implement the most important supervised learning techniques.

CO2:Formulate valid solutions for problems involving datasets by using decision making techniques.

CO3:Demonstrate dimensionality reduction algorithm for large amount datas.

CO4:Design and evaluate intelligent expert modelsfor prediction and classifications.

CO5: Demonstrate and enrich knowledge to select and apply tools (WEKA, PyTorch, etc.,) forbusiness application area.

Board of Studies (BoS) :

19thBoS was held on 13.02.2023

Academic Council:

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	L													
CO2	L		H											
CO3	H													L
CO4					H	L							L	
CO5					H									

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Programming concepts, plan & features are taught in this course for the learners with respect to the course outcomes are measurable and useful in improving the programming and logical skill of the learner.

CADX 117	ANIMATION LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

- COB1:**Build skills to create animation.
- COB2:**Understand the concept in animation art making.
- COB3:**Develop animation with the objects.
- COB4:**Sketching animated webbanners.
- COB5:**Provide interactivity, cut animations and creativity.

PRACTICALS

List of Experiments:

1. Creating a Logo Animation in Adobe Flash
2. Create scenery using drawing tools in adobe flash line tool, shape tool, pencil, brushes, fills, strokes, gradient.
3. Make animations of coin drop, ball bounce, path animation using Blender.
4. Create any Model of Cars or Bike using Blender.
5. Create any Model of any animal using blender.
6. Implement the Frame-by-frame animations (Butterfly, Birdfly, biped walks, quadruped walks) using blender.
7. Implement Cutout animations (Character animations, lip-sync animation, walks, body movements with dialogues) using blender.
8. Create a short animation of lip sync, body movement and character interaction using blender.
9. Render a frame and video of indoor and outdoor scenes using blender.
10. Create a scene with a waterfall or fountain using blender.

P – 60 ; TOTAL HOURS – 60

TEXT BOOKS:

3. Casey barre, "Photoshop for beginner's guide: Tutorials, Elements, Art, Backgrounds, Design, Tools and More, "Abbott Properties, 2022.
4. Tay Vaughan, "Multimedia: Making It Work," Seventh Edition, Tata Mc-Graw Hill, 2008.

REFERENCES:

1. Ranjan Parekh, "Principles of Multimedia", Second Edition, TMH, 2006.

COURSE OUTCOMES:

CO1: Develop experiments with different animation tools.

CO2: Formulate movieclips and graphics.

CO3: Apply animation in object, human and animals.

CO4: Familiarize with animated webbanners.

Board of Studies (BoS):

9th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on
13.4.23.

	P O1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1						L						L			
CO2	L	M		L					L						
CO3					L			M				M			M
CO4	L		H											L	
CO5										L	M		L	H	

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The Animation lab helps the learners to design games for multiple genres and how to make a game formally.

TECHNOLOGY CORE LAB III (SEMESTER V)

CADX118	Cloud Services for Data Science	L	T	P	C
SDG: 9	Laboratory	0	0	4	2

COURSE OBJECTIVES:

COB1: Understand the fundamental principles of cloud services.

COB2: Gain the knowledge about the amazon web services.

COB3: Know the importance of cloud services in data science.

COB4: Identify and define technical challenges for cloud applications and assess their importance.

COB5: Learn the real-life applications of cloud deployment.

PRACTICALS

List of Experiments:

1. Create an account in amazon web services (AWS)
2. Explore the storage space of your EC2 instance using Amazon EBS.
3. Implement the online cloud-enabled bookstore system.
4. Create a student attendance maintenance system using AWS.
5. Develop the cloud-enabled Elastic File System.
6. Develop the mass e-mailing using AWS Lambda.
7. Explore a static website with S3 and CloudFront.
8. Create a Text-to-speech Conversion with SageMaker.
9. Implement the Nvision enables machine learning services for text extraction from images.
10. Create a chatbot applications using Artificial Intelligence (AI) in AWS.

TOTAL HOURS - 60

TEXT BOOKS:

1. Wilkins, M. (2019). Learning Amazon Web Services (AWS). Addison-Wesley Professional.
2. Tim Mather, Subra Kumara swamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'Reilly Media, 2009.

REFERENCES:

1. Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski: "Cloud Computing: Principles and Paradigms", Wiley, 2011

3. Nikos Antonopoulos, Lee Gillam: "Cloud Computing: Principles, Systems and Applications", Springer, 2012

COURSE OUTCOMES:

CO1:Create user account in cloud service providers.

CO2:Store and process the data in Amazon web services.

CO3:Explore the various file systems in AWS.

CO4:Building a big data pipeline in Amazon EMR.

CO5:Solve the real-world applications in cloud environments.

Board of Studies (BoS) :

19thBoS was held on 13.02.2023

Academic Council:

20th meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						L						L		
CO2		L		L					M					L
CO3					L			L				M		
CO4	L													L
CO5											M		L	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The students can develop and implement the real time problems in Amazon web services (AWS).

CADX 119	VIRTUALIZATION LABORATORY	L	T	P	C
		0	0	4	2

SDG: 9

COURSE OBJECTIVES:

COB1: Provide the knowledge for vmware installation and configuration

COB2: Cover the fundamentals of vmwarecenter in virtual machine.

COB3: Explore Knowledge about vsphere client

COB4: Create clone machine and explore the settings.

COB5: Work with real time scenario.

PRACTICALS

List of Experiments:

1. Installation and configuration of VmwareESXi server 6.5- a type-1 hypervisor on host machine to deploy a virtual machine.
2. Install Oracle Virtual box and create two VMs on your laptop.
3. To write a Procedure to create a snapshot in a Oracle Virtual box.
4. Install a C compiler in the virtual machine and execute a sample program.
5. Installation and deployment of VmwarevCenter in a virtual machine that runs on an ESXihost.
6. To write a procedure implement a virtual private cloud in google.
7. To write a procedure to migrate an application in between cloud.
8. Creation of Virtual Machines using vCenter server on a machine that has access to ESXi host by instllingVsphere client.
9. Test ping command to test the communication between the guest OS and Host OS.
10. Develop a windows Azure hello world program using ASP.net.
11. Install Google App Engine. Create hello world app and other simple web applications using python/java
12. Installation and configuration of NSX manager.
13. Modify virtual machine settings by adjusting the configuration like hardware, adding new virtual hard disk, number of virtual processor and memory settings.
14. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.

TOTAL HOURS –60

REFERENCES:

1. Aaron Tiensivu, Ken Majors, Geoffrey Green, David Rule, Andy Jones, MatthijsteSeldam, Syngress Publications, 2006.
2. Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka Menken, Gerard Blokdijk, Lightning Source Incorporated, 2008
3. Virtualization: From the Desktop to the Enterprise, Chris Wolf, Erick M. Halter, EBook, 2005
4. <https://hol.vmware.com/catalog/#/>
5. <https://labs.hol.vmware.com/HOL/catalogs/catalog/1936>

COURSE OUTCOMES:

CO1: Provide information about vmware EXSI

CO2:Work on vmware EXSI type 1 hypervisor

CO3: Know more about vmwarevcenter and vsphere client

CO4:Know more about clone virtual machine

CO5:Work with real time virtualization scenario.

Board of Studies (BoS) :

19th BOS was held on 13.02.2023.

Academic Council:

20thmeeting of AC held on 13.4.23.

	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		M												
CO2				L		M					L			
CO3								M						
CO4							L							
CO5			L										H	

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: By learning Virtualization, the student can work, develop and deploy virtualization tools, aware of various virtualization technologies.

CADX 121	XML AND WEB SERVICES LABORATORY	L	T	P	C
		0	0	4	2

SDG: 9

COURSE OBJECTIVES:

COB1: Provide the knowledge necessary to build and validate XML.

COB2: Cover the fundamentals of XML, DTD and Schema.

COB3: Gain knowledge about XML presentation and transformation technologies.

COB4: Build and consume web services

COB5: learn how to implement and deploy web service client and server.

PRACTICALS

List of Experiments:

1. Create an XML document to store the book information.
2. Create an XML document to store information about books and create the DTD files. (Both Internal and External DTD).
3. Creation of XML Document with Schema.
4. Create a simple XML document to display the book details and validate the xml with xml schema.
5. Present the book's XML document using cascading style sheets (CSS).
6. Write an XSLT program to extract book titles, authors, publications, book rating from the book's XML document and use formatting.
7. Use Microsoft DOM to navigate and extract information from the book's XML document.
8. Use Microsoft DSO to connect HTML form or VB form to the book's XML document and display the information
9. Create a web service for temperature conversion with appropriate client program using JAX-WS.
10. Create a web service for currency conversion (at five currencies) with appropriate client program using .NET framework.

TOTAL HOURS – 60

REFERENCES:

1. Richards, Robert. "Pro PHP XML and Web Services", United States, Apress, 2016.
2. Blokdyk, Gerardus. Java API for XML Web Services Complete Self-Assessment Guide. N.p., Emereo Pty Limited, 2018.

COURSE OUTCOMES:

CO1:Build effective XML documents.

CO2:Create Schema documents to validate XML.

CO3:Develop and apply XSLT.

CO4:Design and development applications using XML, DOM parser.

CO5:Create and implement the web service using Java and .NET framework.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

9th BOS was held on
13.02.2023.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					M			L	L	L		L			L
CO2					M	L		L	L					L	
CO3	L				L						L				M
CO4	L				H									L	
CO5					H			L		L	M			H	L

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

In the course, concepts and technologies for business applications were covered. The student will be able to create, deploy, and accurately make decisions for future industrial and infrastructure projects by recognizing the concepts and working with different standards and protocols.

CADX 126	COMPUTER VISION LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

COB1: Use the fundamental image operations on geometric transformation.

COB2: Gain the knowledge of image colour channels.

COB3: Understand to extract image parameters and matrix computation in images.

COB4: Implement the various detection and extraction techniques.

COB5: Explore the need of Object detection and recognition.

List of Experiments:

1. Perform basic image handling and processing operations on the image.
2. Geometric transformation and apply it to images.
3. Display the histogram of the original and negative images, and apply histogram equalization to enhance image contrast.
4. Develop a GUI to perform Morphological operations.
5. Remove the projective distortion in the image using homography.
6. Calibrate the camera and extract the intrinsic and extrinsic parameters of the camera.
7. Implement the fundamental matrix computation using the least square minimization and 8-point algorithm.
8. Implement the edge detection using Sobel, Prewitt and canny operator.
9. Detect the line using Hough Transform.
10. Generate a panorama image using SIFT feature descriptor
11. Implement the SURF feature descriptor for an application.
12. Detect the pedestrians in an image using HOG feature descriptors.
13. Object detection and tracking.

P – 60 ; TOTAL HOURS – 60

TEXT BOOKS:

1. Dey, Sandipan. *Hands-On Image Processing with Python: Expert techniques for advanced image analysis and effective interpretation of image data*. Packt Publishing Ltd, 2018.

REFERENCES:

2. Distanto, Arcangelo, et al. *Handbook of image processing and computer vision*. Springer International Publishing, 2020.

3. Gonzalez, Rafael C., and Richard E. Woods. "Digital Image Processing, Hoboken." *NJ: Pearson* (2018).

COURSE OUTCOMES:

CO1: Gain the Fundamental knowledge of basic image transformations.

CO2: Acquire the knowledge of image channels to extract the color features for applications.

CO3: Identify important image features for further computer vision model development.

CO4: Analyze and enhance the image enhancement techniques.

CO5: Develop the efficient models for real-world applications.

Board of Studies (BoS) :

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2
CO1					M		M					M		
CO2	H						M						M	
CO3				M							M			
CO4					H									
CO5											M			

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Implement real-world computer vision projects, from concepts through deployment, demonstrating proficiency in solving industry-specific challenges and real time scenario.

CADX 127	NATURAL LANGUAGE PROCESSING	L	T	P	C
SDG: 9	LABORATORY	0	0	4	2

COURSE OBJECTIVES:

COB1: Use the NLTK and spaCy toolkit for NLP Programming

COB2: Demonstrate the use of modern NLP techniques for processing of text

COB3: Analyze various corpora for developing programs

COB4: Implement NLP tools like tokenizer, classifier and stemmer for natural languages

COB5: Build applications using various NLP techniques for a given corpus

List of Experiments:

1. Installing NLTK (Prerequisite)
2. Write a program to implement word Tokenizer and find the number of words in a given sentence.
3. Write a program to filter Stop words in a given passage
4. Develop a program to implement Porter and N-gram stemming techniques.
5. Write a program to implement
 - (i) Dictionary based Lemmatization technique
 - (ii) Rule-base Lemmatization technique
6. Write a program to implement Word Replacement in a given sentence
7. Write a program to implement Synonym & Antonym Replacement
8. Write a program to print all words beginning with a given sequence of letters
9. Write a program to identify the Basics of Part-of-Speech (POS) Tagging using
10. Hidden Markov Model (HMM)
11. Conditional Random Fields (crf)
12. Write a program to find hyponymy, homonymy, polysemy for a given word
13. Write a program to implement both user-defined and pre-defined functions to generate
 - (a) Uni-grams (b) Bi-grams (c) Tri-grams (d) N-grams
14. Write a program to implement TF-IDF for any corpus.

P – 60; TOTAL HOURS – 60

TEXT BOOKS:

1. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.
2. Richard M Reese, —Natural Language Processing with Javall, O'Reilly Media, 2015.

REFERENCES:

1. NLTK – Tutorial by Tutorials point

COURSE OUTCOMES:**CO1:** Develop NLP programs in Python**CO2:** Demonstrate the use of modern NLP techniques for processing of text.**CO3:** Implement NLP tools like classifiers, translators, PoS taggers & stemmers for natural languages**CO4:** Develop an application using Python and NLP toolkit for analyzing natural languages**CO5:** Use various machine learning algorithms for classifying texts**Board of Studies (BoS) :**20th BoS of CA held on 17.05.2024**Academic Council:**22nd ACM held on 04.09.2024**Note:** L - Low Correlation M - Medium Correlation H - High Correlation

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2
CO1	M		H			M								
CO2			H		H	M		L			M		M	M
CO3		M	H				L		M				M	
CO4		H	H		H	M	M			M	M		M	M
CO5			H		H	M	M			L				

SDG 9:

Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

The course describes the concepts of securing the virtualized cloud environment. Understanding and applying the security concepts in the virtualized environment make the cloud platform a robust technology which enables the learners to widely use the cloud infrastructure for their business requirements.

CADX 131	INFORMATION SECURITY LABORATORY	L	T	P	C
SDG: 9		0	0	4	2

COURSE OBJECTIVES:

COB1: To Learn concepts and encryption Techniques to solve the problems.

COB2: To Implement DES, AES and blowfish algorithm.

COB3: To understand the symmetric and asymmetric encryption system.

COB4: To work on anonymity and privacy oriented OS and email.

COB5: To analyse vulnerability using various tools

PRACTICALS

List of Experiments:

1. Encryption and Decryption techniques using Ceaser cipher and hill cipher.
2. Write a java program to implement DES algorithm.
3. Write a java program to implement AES algorithm.
4. Write a java program to implement blowfish algorithm.
5. Implement the Diffie-Hellman Key Exchange algorithm using html and java script.
6. Installation of Tor browser, its bridges to enhance secure browsing.
7. Implement Anonymity and privacy using TAILS Operating System.
8. Creating Temporary and private email.
9. Image steganography using OpenStego.
10. Virus analysis using OllyDbg.
11. Vulnerability analysis –CGI scanning with Nikto
12. Demo on working of SHA-1 hashing, block using andersbrownworth.

P – 60; TOTAL HOURS – 60

TEXT BOOKS:

1. William Stallings, Cryptography and network security principles and practice 8th global edition 2022.

REFERENCES:

1. Stuart McClure, Joel Scambray, George Kurtz “Hacking Exposed 7:Network Security Secrets & Solutions”, Seventh Edition, McGraw Hill, Professional 2012.
2. <https://proton.me/mail>
3. <https://www.byom.de/>
4. <https://tb-manual.torproject.org/installation/>

COURSE OUTCOMES:

CO1: Understand the various encryption and decryption techniques to solve the problems.

CO2: Study the real time software's using DES, AES and blowfish algorithms.

CO3: Develop information exchange using symmetric and asymmetric encryption system.

CO4: Securely work on internet without data log stored on system and ISP

CO5: Identify, collect and analyze vulnerability datas.

Board of Studies (BoS) :

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1															
CO2				L											
CO3								M							
CO4		M				M									
CO5													L		

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Brief description in two - three lines connecting the course outcomes with the SDG

TECHNOLOGY CORE COURSE (SEMESTER VI)

CADX 216	IT GOVERNANCE, RISK AND INFORMATION SECURITY MANAGEMENT	L	T	P	C
		3	0	0	3

SDG: 4

COURSE OBJECTIVES:

COB1: Introduce the concepts of IT governance and its best practices

COB2: Explore IT Governance framework and roadmap

COB3: Provide an overview of risk management program.

COB4: Present the Information Security Governance and its Importance.

COB5: Explore information security management practices and its related case studies

MODULE I IT GOVERNANCE FUNDAMENTAL 9

Introduction- background - Standards - Cultural aspects – Benefits - key terms - Best Practices and pillars - Corporate Governance - Decision Rights - Future state of IT Governance.

MODULE II IT GOVERNANCE FRAMEWORK AND ROADMAP 9

Framework - Val-IT framework of ISACA - Pillars of Effective IT Governance - IT Alignment and Demand Management
- Benefits of using an Integrated Framework - Role of IT Strategy Committee and Security Steering Committee - Planning and Implementation - Execution Management

MODULE III RISK MANAGEMENT 9

Risk management concepts - The global risk environment - International risk management standards - Risk management frameworks - Risk management processes, perspectives and responsibilities - Evaluating and reporting risk - Risk control strategies - Trends and future developments for risk management.

MODULE IV INFORMATION SECURITY GOVERNANCE 9

Effective Information Security Governance - Importance and Outcomes - Strategic alignment – Performance Measurement - Information System Strategy - Strategic Planning - Policies and Procedures - Role of Governance in Information Security - Security Metrics.

**MODULE V INFORMATION SECURITY MANAGEMENT PRACTICES 9
AND CASE STUDY**

Personnel Management - Financial Management - Quality Management - Information Security Management - Performance Optimization - Roles and Responsibilities - Auditing IT Governance Structure - Evaluation Criteria & Benchmark - Assessment Tools - Case Study of a mid-size commercial organization.

L -45 ; TOTAL HOURS:- 45

TEXT BOOKS:

1. Ken Sigler, and James L. Rainey "Securing an IT Organization through Governance, Risk Management, and Audit", CRC Press, 2017.
2. Paul Hopkin, "Fundamentals of Risk Management", Fourth edition 2017, ISBN 9780 7494 7961 9

REFERENCES:

1. Raymond Pompon, "IT Security Risk Control Management" Apress, 2016.DOI 10.1007/978-1-4842-2140-2.
2. Jake Kouns and Daniel Minoli "Information Technology Risk Management in Enterprise Environments", John Wiley & Sons, Inc., Publication, 2010, ISBN 978-0-471-76254-6.
3. Anthony Tarantino, "Governance, Risk, and Compliance Handbook", John Wiley & Sons, Inc, 2008.

COURSE OUTCOMES:

CO1:Know about IT Governance and its future state of IT Governance

CO2:Learn IT Governance framework and roadmap

CO3:Understand the trends and future developments for risk management program

CO4:Learn about Information Security Governance and its security metrics program

CO5:Recognize Information Security Management Practices and Case Study of a mid-size commercial organization.

Board of Studies (BoS) :

19th BOS was held on 13.02.2023.

Academic Council:20th meeting of AC held on 13.4.23.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		H												
CO2		L	M		H									
CO3			H											
CO4					H								H	
CO5					H		H						H	H

Note: L- Low Correlation M –Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The course outcomes are measurable and help the learners to efficiently perform the information security management practices. Also it enables the learners to Understand the trends and future developments for risk management program .

CADX217	DATA SCIENCE PROJECT	L	T	P	C
SDG: 9	MANAGEMENT	3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the process flow of the Data Science Project Lifecycle

COB2: Learn the Agile Data Science Principles and roles of a Full Stack Data Scientist.

COB3: Integrate the modules and design Project pipeline

COB4: Familiarise the functionalities of agile tools

COB5: Provide solution methodologies for real word applications

MODULE I Data Science Project Life Cycle 9

Software Process and Project Metrics - Determinants for software quality and organizational effectiveness: People; Product; Technology; Process – Object Oriented Metrics – Use case Oriented Metrics –Requirements Analysis – Web Application Project Metrics- Traditional Waterfall Model –Incremental Model- Need for Agile Methodologies for Data Science Project.- DEVOPS Project Life Cycle.

MODULE II Agile Data Science Principles & DEVOPS 9
Project Management.

Problem Definition – Project Modules Description - Manifesto & Seven Principles of ADS- Data-value pyramid–Exploratory Data Analysis & Synthesis-Traditional Waterfall Method vs Agile Data Science Methodology – Data Science Team Roles – Project Schedule – DEVOPS Project Plan

MODULE III Agile Data Science Methodology 9

Module Description –Module wise Tasks & Sprints Model – Proposed System Workflow – Agile Environment & Engineering productivity- Data Immersion & Realizing Ideas with large Scale Printing –Data Science Project Pipeline - Code Review & Pair Programming - Quality Assurance.

MODULE IV Agile Tools & Functionalities 9

.Full Stack System Software Components & Functionalities - Stack process – Stack Architecture – Data Collection with Kafka – Data processing with SPARK – Apache Spark Ecosystem – Machine Learning with Spark MLlib / Distributed WEKA with APACHE Spark.

MODULE V Applications & Industry Case Studies 9

Education - Health Care – Supply Chain & Logistics – Travel & Tourism – Drug Discovery.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Russell Journey, “Agile Data Science 2.0 Building Full-Stack Data Analytics Applications with Spark”, Copyright © 2017 Data Syndrome LLC. Published by O’Reilly Media, Inc.
2. Pressman Roger S, SOFTWARE ENGINEERING: A PRACTITIONER’S APPROACH, SEVENTH EDITION, ISBN 978-0-07-337597-7
3. Data Science for Dummies®, 2nd Edition Published by: John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030-5774, www.wiley.com Copyright © 2017 by John Wiley & Sons, Inc., Hoboken, New Jersey

REFERENCES:

1. Kirill Dubovikkov, “Managing Data Science”, Publisher-Packt Publishing Ltd, 2019, ISBN 978-1-83882-632-1
2. John C. Goodpasture, PMP “Project management the agile way : making it work in the enterprise”, Copyright © 2016 by J. Ross Publishing, ISBN-13: 978-1-60427-115-7

COURSE OUTCOMES:

CO1: Perform requirement analysis for the undertaken Data Science Project

CO2: Design the Data Science Data & Project Pipeline

CO3: Write code for application development and predictive analytics

CO4: Integrate all the modules and generate reports and creative dashboards

CO5: Solve real world Problems and provide solution methodologies for the applications.

Board of Studies (BoS) :

19th BoS was held on 13.02.2023

Academic Council:

20th meeting of AC held on 13.4.23.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		H	L										L	
CO2		L	L						L	L			L	
CO3									H					
CO4			M		H					M				M
CO5		M							M				M	L

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG 9:industry, innovation and infrastructure

Statement:The data science project management with agile methodology and DevOps were taught in this course. Understanding the insights of project management motivate the student to Understand and explore the agile based concepts wisely and Learn agile based tools and implementing innovative ideas with data science approaches. The knowledge attained through agile and DevOps concepts will improve the skills set of the student to meet industrial demand.

CADX 218	WEB AND E-BUSINESS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

The objective is to help students to,

COB1: Learn the e-business strategy and E-commerce concepts

COB2: Understand the e business models and Infrastructures.

COB3: Gain knowledge about the Infrastructure of E-Markets and Law for E business

COB4: Analyze and develop the E business networks model

COB5: Compare the E business integration and Supply chain management

MODULE I INTRODUCTION TO E-BUSINESS 9

An overview of E-Business-e-Business Strategy-E Business Marketing-Types of Ecommerce and E business- - E-business Architectural and Frame work – Online Trading -E business Applications - Security threats in E-Business- Benefits –limitations

MODULE II E BUSINESS MODELS 9

E Business Models-Business - to - Business (B2B)- Business - to - Consumer (B2C)- Consumer - to - Consumer (C2C)-Classifications of e- business–Intra organizational ecommerce and Inter organization ecommerce.

MODULE III E-BUSINESSTECHNOLOGICAL INFRASTRUCTURE 9

Governance Structure –E Business Technological Infrastructure- E-Markets- Online Payment – E-Security – Security Protocols – Internet Governance – Firewall Legal Issues: Software Intellectual Property Law – Contract Law for E-Business – Cyber Law Issues

MODULE IV E-BUSINESS NETWORKS 9

E-Procurements –E Business Networks- Strategic and operational procurement- Information support for procurement- Types of procurement solutions- Market for e-procurement service provider.

MODULE V E-BUSINESSINTEGRATION 9

E-business modeling- Security and reliability- Ebusiness integration – E-Marketing – E Advertisement -Intelligent Agents – Economics in Ecommerce – Equilibrium price – Supply Chain Management.

L –45 ; TOTAL HOURS –45

TEXT BOOKS:

1. Trites, G. and Boritz, J., e Business: A Canadian Perspective for a Networked World Pearson, Toronto Canada, 4 th Edition, 2013.
2. Chaffy, D., E- business & Commerce Management, Marketing insights limited, Harlow, England, 5 th Edition, 2012.

REFERENCES:

1. Afuah, A., Business Model Innovation: Concepts, Analysis, and Cases, 2014.
2. Joseph, P.T., E-Commerce: An Indian Perspective, 4th Edition,,2012.

COURSE OUTCOMES:

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

CO1: Demonstrate an understanding of the foundations and importance of Ecommerce

CO2:Identify the E business Models and Infrastructure

CO3: Analyze the impact of E-commerce on business models and strategy

CO4:Develop the Internet trading relationships including Business to Consumer,Business-to-Business, Intra-organizational

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on 13.4.23

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1			L											
CO2							M							
CO3			M				M						M	
CO4					M	M	M						L	
CO5			H										H	L

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

The learner will be able to develop secured web transactions for the real life applications. Students will learn how e business concepts are applied to different field. This course will knowledge to the students with online business ideas and motivate them to apply in the real life.

CADX 223	INTELLIGENT SYSTEMS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: Infer the concept of Intelligent systems and applications.

COB2: Apprehend the foundation of fuzzy logic and neural networks.

COB3: Understand the working principle of Intelligent systems and its applications.

COB4: Analyse on various theoretical techniques and applications in intelligent systems.

COB5: Analyse various real time case studies related to Intelligent systems.

MODULE I INTRODUCTION TO INTELLIGENT SYSTEMS 9

Introduction: Expert systems and knowledge representation - various approaches to Intelligent Systems - Pattern recognition and classifications - Genetic algorithms - Evolutionary computing - Biologically inspired methods– intelligent agents - AI systems of the future.

MODULE II FUZZY LOGIC AND ANN 9

Fuzzy sets and fuzzy logic - Basic elements of fuzzy systems – Fuzzification - Fuzzy inference - ANN structures - Basic units - Network topology - ANN training algorithms: Supervised learning - Reinforcement learning - Unsupervised learning - Deep Learning - ANN applications: Adaptive control using ANN and fuzzy neural networks .

MODULE III INTELLIGENT AGENTS 9

Structure and architecture of agents – Classification – Applications – Types of agents: Simple reflex agents – Reflex agents with state – Goal-based agents – Utility-based agents – Learning agents - Agents in AI – Intelligent agent – Agent environment in AI - Agent-based modelling and simulation.

MODULE IV INTELLIGENT SYSTEM TOOLS 9

Pre-trained NLP models: Amazon Comprehend – Google cloud NLP – Customer feedback case study: Thematic – Customizing text analysis models: MonkeyLearn – Advanced text analytics: IBM Watson – text analytics libraries: Lexalytics.

MODULE V CASE STUDIES AND APPLICATIONS**9**

Factory Automation -Field and Service Robotics–Assistive Robotics -Military Applications – Business Intelligence – Recommendation Systems – Social Network Analysis – Healthcare Analytics – Industrial Automation – Medical Data Analysis – Industry 5.2.

L – 45; TOTAL HOURS – 45**TEXT BOOKS:**

1. Tadeusiewicz, Ryszard, "Introduction to Intelligent Systems", CRC Press, 2nd Ed. 2016.
2. S, Rajasekaran& G.A. VijayalakshmiPai, "Neural Networks, Fuzzy systems and evolutionary algorithms: Synthesis and Applications", PHI Publication, 2nd Ed. 2017.
3. Hulten, Geoff, "Building Intelligent Systems: A Guide to Machine Learning Engineering", Apress, 1st edition (2018).

REFERENCES:

1. JanuszKacprzyk, Lakhmi C. Jain, "Intelligent Systems Reference Libraray", Springer series, 2024.
2. Adrian. A. Hopgood, "Intelligent Systems For Engineers And Scientists", CRC Press, Third Edition, 2011.

COURSE OUTCOMES:

- CO1:** Identify various mechanisms to incorporate AI techniques for creating Intelligent systems.
- CO2:** Demonstrate fuzzy logic and ANN methods for Intelligent systems development.
- CO3:** Effectively use Intelligent agents to solve complex problems.
- CO4:** Implement latest tools pertaining to Intelligent systems for effective computation.
- CO5:** Develop various business models using Intelligent systems for real time analytics.

Board of Studies (BoS) :20th BoS of CA held on 17.05.2024**Academic Council:**22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L												L	
CO2	H												M	
CO3	M	M									M		H	
CO4		L	M	M	H	H			L	L	H	M		M
CO5		H	M	H	M		H	H	M		L	H		H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4:

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:

The basics of intelligent systems and its techniques were educated in this course. Understanding the insights of fuzzy logic, neural networks and intelligent agents will motivate the student to incorporate the tools and techniques in needed of real-time scenarios. The applications of this course will improve the skill set of the student to meet the demands in IT sector.

CADX 228 **CYBER LAW** **L T P C**

SDG: 9 **3 0 0 3**

COURSE OBJECTIVES:

COB1: Understand the Fundamentals of Cyber Laws

COB2: Learn the governance skills through digitalized data

COB3: Gain the knowledge of Investigation based on Indian Penal Code.

COB4: Acquire the working knowledge of Cyber security with Legal issues.

COB5: Learn the data protection and privacy.

MODULE I FUNDAMENTALS OF CYBER LAW 9

Introduction on cyber space - History of Internet - Cyber Security Definition - Various components of cyber law - Data and privacy - Cybercrimes - Intellectual property - Electronic and digital signatures - Information Technology Act,2000.

MODULE II E-COMMERCE AND ELECTRONIC GOVERNANCE 9

Electronic Governance - UNCITRAL Model law on Electronic Commerce- Cryptography - Trends and Prospects of E-Commerce - E-taxation -E-banking, Payment mechanism in cyberspace - Online publishing - Online payment - E-Contracts - Encryption and decryption. ISO 27000 series-different sectors and levels.

MODULE III CYBER CRIMES 9

Cyber Crimes - Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime – Cyber Offences - Introduction to Incident Response – Digital Forensics–Relevant provisions under Information Technology Act, 2000, Indian Penal Code, Pornography Act and Evidence Act etc. - Cybercrime against women & children -Investigation and Adjudication of Cyber Crimes in India - Cyber Arbitration.

MODULE IV CYBER SECURITY 9

Definition of Computer & Cyber Security - Types of Attacks –Network Security- Overview of Security threats-Email security-Database Security - Introduction to Information Security - Access Control – Communications Security - Computer

Operations Security - Physical Security - Law, Investigation and Ethics– International Governance; Copyright Issues in the Internet - Protection of Computer Software - Trademark Issues in the Internet – Domain Name Registration - Domain Name Dispute - Linking - Meta tagging – Database issues in the internet-Cyber Security Breaches –Dispute resolution.

MODULE V ASSET MANAGEMENT AND CHALLENGES 9

Concept of Data - Information privacy - Data protection - Freedom of information -Privacy as a fundamental right - Violation of Privacy on Internet - Data Protection and Privacy – General Data Protection Rules - Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules, 2011. Case Study: IT & Transport.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. "Cyber Law in India" by Pavan Duggal - Pavan Duggal is a well-known expert in cyber law, and this book offers insights into various aspects of cyber law in the Indian context (2016).

REFERENCES:

1. N.S Nappinai– Technology Laws, 1st Ed LexisNexis (2017)
2. Apar Gupta, Commentary on Information Technology Act (2016).
3. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing, UP, 2016.
4. Farouq Ahmed, Cyber Law in India, Allahabad Law Agency, 2015
5. Karnika Seth, Computers, Internet and New Technology Laws-A Comprehensive Reference Work With Special Focus On Developments In India, LexisNexis, Nagpur, 2016.
6. Kamath Nandan: Law relating to Computer, Internet and E-Commerce, Universal Law, Publishing, UP, 2007.
7. "Cyber Laws: A Global Perspective" by Prashant Mali.
8. "Cyber Laws and IT Protection" by Vakul Sharma.
9. "Cyber Laws Simplified: Laws for E-Commerce, E-Governance, Cyber Crimes & Cyber Security" by VivekSood.
10. "Textbook on Cyber Law" by I.P. Massey.

COURSE OUTCOMES:**CO1:** Apply the Law according to the region**CO2:** Able to access the data digitally**CO3:** Can investigate the crime in Indian Penal Code**CO4:** Implement the cyber security with legal issues.**CO5:** Able to protect the data and privacy.**Board of Studies (BoS):**20th BoS of CA held on 17.05.2024**Academic Council:**22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1			M												
CO2			L		M									L	
CO3					M							L			
CO4								M							
CO5										M					

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The holistic understanding of building Applications and components leads to new innovations in the IT Industry.

PROGRAMME ELECTIVE – I

CADX 250	E-COMMERCE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Introduce basic e-commerce concepts

COB2: Learn the installation procedure of Content management System with appropriate user interface.

COB3: Learn to integrate Payment Gateway

COB4: Understand the security measures.

COB 5: Analyse the ecommerce case studies of different business verticals

MODULE I INTRODUCTION TO E-COMMERCE & WEB DESIGNING 9
TECHNIQUES.

E-Commerce business models - Overview of developments in Information Technology and Defining E- Commerce:, Electronic Market, Internet Commerce, Benefits and limitations of E- Commerce, Changing Your Background Graphic, CSS selectors - CSS IDs and classes - CSS properties and values - Understanding Basic HTML5 Techniques.

MODULE II CONTENT MANAGEMENT SYSTEM 9

WordPress Basics: Exploring Basic Wordpress Concepts - Wordpress Community. Setting Up the Wordpress Software: Understanding the System Requirements – Xampp server - Installing WordPress on Your Web Server. Configuring WordPress for Optimum Security. Exploring the WordPress Dashboard. – Installing the themes -Publishing Your Site with WordPress – Design and development of personal page

MODULE III CMS PLUGINS & PAYMENT GATEWAY 9

Introducing Wordpress Plugins - Installing and Managing Plugins - Configuring and using Plugins: Contact form 7 - Woo Commerce. E-mail, Google Analytics plugin. Appmaker: convert wordpress to mobile app. Payment gateway :WooCommerce PayPal Checkout Payment Gateway. Digital economy: Identify the methods of payments on the net – Electronic Cash, cheques and credit cards on the Internet.

MODULE IV B2B & SECURITY 9

Wholesale Suite – WooCommerce Wholesale Prices & B2B Plugin. Threats in Computer Systems: Virus, Cyber Crime Network Security: Encryption, Protecting Web server with a Firewall, Firewall and the Security Policy, wordpress Firewalls and security, Proxy Server.

MODULE V BUSINESS CASE STUDIES 9

B2B Healthcare Portal, Chennaiibazaar.com Automartindia.com, ModelSulekha.com, Sify.com, eGurucool.com.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. E-commerce Business: 3 Books in 1: The Ultimate Guide to Make Money Online From Home and Reach Financial Freedom - Passive Income Ideas 2020,4 by RonaldAnderson.
2. Web Coding & Development All - in - One For Dummies
3. The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business Paperback – 30 March 2004 by Janice Reynolds.
4. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd, January2002.
5. Ravi Kolkata, Andrew B. Whinstone, "Electronic Commerce-A Manager's guide",Addison-Wesley.
6. P.T.Joseph, E-Commerce An Indian Perspective, Fourth Edition, PHI Learning private limited.

REFERENCES:

1. Efraim Turban, Jae Lee, David King, H.Michael Chung, "Electronic Commerce–A ManagerialPerspective", Addison- Wesley.
2. Elias M Award, "Electronic Commerce from Vision to Fulfilment", 3rd Edition, PHI, Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3RDEdition, Pearson Education.
3. Kenneth C. Laudon, E-Commerce: Business, Technology, Society, 4th Edition,Pearson
4. S. J. Joseph, E-Commerce: an Indian perspective,PH

COURSE OUTCOMES:

Upon completion of the course students should be able to:

CO1: design the basic framework of ecommerce website

CO2: install the CMS and provide UI/UX

CO3: integrate payment gateway in the web portal

CO4: design and Develop exclusive B2B web portals

CO5: demonstrate the various functionalities of the ecommerce technologies in the business case studies.

Board of Studies (BoS):

BoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H													
CO2		H			M			L			H		H	
CO3			H	H		H				M				H
CO4				M								H		
CO5													M	

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

E-commerce is a complex system and the digital transformation of our economies and societies requires a partnership between companies and the international industrialization community to create awareness of the impact on E-business sustainable innovation.

CADX 251	INFORMATION RETRIEVAL	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1 :To introduce students about insights of the several topics of Information retrieval such as – Boolean retrieval model, Vector space model, indexing.

COB2:To provide an overview of Text classification & Text clustering.

COB3:To introduce students about insights of the Content Based Image Retrieval

COB4:To provide implementation insight about the Dictionary and Postings.

COB5:To provide comprehensive details about the various application of Information Retrieval.

MODULE I INTRODUCTION TO INFORMATION RETRIEVAL 9

Meaning, Process and Indexing of Information retrieval, Information retrieval model-Boolean, Vector and Probabilistic IR models.

MODULE II TEXT CLASSIFICATION & TEXT CLUSTERING 9

Overview of classification & clustering of Text, Problem of text classification, Naive Bayes text classification, k- nearest neighbors, Support vector Machine , Feature Selection, Vector-space clustering.

MODULE III CONTENT BASED IMAGE RETRIEVAL 9

Introduction to content Based Image retrieval, Challenges in Image retrieval, Image representation, Indexing and retrieving images, Relevance feedback.

MODULE IV DICTIONARY AND POSTINGS 9

Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; NLP toolkit in Python

MODULE V INFORMATION RETRIEVAL APPLICATIONS 9

IR applications, Information extraction, Question answering, Opinion summarization and Social Network.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Christopher D. Manning, PrabhakarRaghavan and HinrichSchütze, Introduction to Information Retrieval, Cambridge University. <http://nlp.stanford.edu/IR-book/information-retrieval-book.html> April 1, 2009.

2. Natural Language Processing And Information Retrieval by Tanveer Siddiqui and U. S. Tiwary, Oxford University Press, 2008.
3. Information Retrieval Algorithm & Heuristics by David A.Grossman ISBN 9789402416787 Springer India, 2019.
4. Leonard Richardson, "Beautiful Soup Documentation Release 4.4.0" - Dec 24, 2019.

REFERENCES:

1. ChengXiangZhai, Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies), Morgan & Claypool Publishers, 2008.
2. "Speech and Language Processing, 2nd Edition", by Daniel Jurafsky and James H. Martin, ISBN: 978-0131873216, Prentice Hall 2008.
3. "Solr in Action" by Trey Grainger, Timothy Potter, ISBN: 9781617291029, Manning Publications 2014.
4. Ryan Mitchell, "Web Scraping with Python" - Collecting Data from the Modern Web, June 2015.

COURSE OUTCOMES:

After completing the course the students will be able to:

CO1: describe the different Information retrieval models.

CO2 :get the understanding the overview of Text classification & Text clustering.

CO3 : demonstrate the Content Based Image Retrieval

CO4 :describe the concept of Dictionary and Postings.

CO5: apply the information retrievals model.

Board of Studies (BoS):

BoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		M	M											
CO2					M									
CO3					M									
CO4														H
CO5														H

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:The learner would develop skills for building the information modeling required for the government’s projects on infrastructure by mastering the information retrieval methods included in the above subject. Information highway itself is a modern infrastructure required for the SMART cities.

CADX 252	SOCIAL MEDIA ANALYSIS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to

COB 1: understand the social, economic, and technological networks and human behavior in social web and related communities.

COB 2: understand the social network concepts and various methods of analysis.

COB 3: acquire techniques for analyzing social network data.

COB 4: understand the various methods of social media analysis.

COB 5: expose and train on various tools and techniques for analyzing and visualizing social media networks.

MODULE I INTRODUCTION TO SOCIAL NETWORKS 9

Connected World – Networks: Actors, Relations and Attributes - Networks as Information Maps - Networks as Conduits – Leaders and Followers – Psychological foundations of social networks – Basic building Blocks – Brief history of Social Network Analysis. Introduction to various social media platforms – facebook , twitter, linkedin ,blogs ,Instagram ,YouTube etc.

MODULE II NETWORK CONCEPTS FUNDAMENTAL 9

Individual Members of the Network – Sociological Questions about Relationships –Whole Social Networks- Distributions – Multiplexity – Roles and Positions – Network Segmentation – Graph Theory – Notations for Social Network Data. Points, Lines and Density – Centrality and Centralization – Components, Cores and Cliques – Positions, Roles and Clusters – Dimensions and Displays.

MODULE III SOCIAL NETWORK ANALYSIS 9

Introduction to Social Network Analysis (SNA): definition and origin, core features of the SNA, Foundation of social network analysis. Networks: nodes, edges, adjacency matrix, one and two-mode networks, node degree, centrality, betweenness, reach, cliques, and paths. Graph Mining: Community detection, Clustering, Community structure, Modularity, Overlapping communities. Graphs – Matrices.

MODULE IV CATEGORIZATION ALGORITHMS 9

Feature selection and text categorization algorithms: Naive Bayes, k Nearest Neighbor (kNN), Logistic Regression, Support Vector Machines and Decision Trees. Evaluation of text classification: precision and recall, confusion matrix,

F-score.

MODULE V TOOLS AND TECHNOLOGIES 9

Twitter Analytics – Facebook Analytics – Google+ Analytics – Google+ Ripples
– R for Social Network Analysis – Pajek – Network Visualization Tools –
Analyzing Social Media Networks with NodeXL.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Charles Kadushin, "Understanding Social Networks: Theories, Concepts, and Findings", Oxford University Press, USA, 2011.
2. David Knoke, Song Yang, "Social Network Analysis", 2nd Edition, SAGE Publications, 2007
3. Mathew A. Russel "Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites " Jan 2011- First edition.
4. Ed. Charu Aggarwal, "Data Classification: Algorithms and Applications" CRC Press, 2014.
5. Gohar F. Khan "Seven Layers of Social Media Analytics:" Mining Business Insights from social media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data- 2015. Luke Welling, Laura Thomsan, PHP and MySQL Web Development (Developer's Library), Pearson Education Publishers, 5th edition, US, 2017.

REFERENCES:

1. Christina Prell, "Social Network Analysis: History, Theory and Methodology", 1st Edition, SAGE Publications Ltd, 2012.
2. Tracy L. Tuten, Michael R. Solomon "Social Media Marketing", SAGE Publications Ltd, 2015.

COURSE OUTCOMES:

On completion of this course, students will be able to

CO1: predict and Analyze human behavior in social web and related communities.

CO 2: apply basic principles of network analysis in social media environment.

CO 3: implement the various SNA methods in real-time business scenario.

CO 4: model the evolution of social networks.

CO 5: construct marketing strategies based on social network analysis.

Board of Studies (BoS):

BoS was held on 23.12.2021

Academic Council:18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1				L			H						H	
CO2		H		M									H	
CO3							L				M			M
CO4				M			M							L
CO5							M				H		M	

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:The social media analysis and its techniques were taught in this course. Understanding the insights of social media analysis will motivate the student to deploy innovative strategies in real-time scenarios. The knowledge attained through social media analysis will improve the skills set of the student to meet industrial demand.

CADX 253	ONLINE ADVERTISEMENT	L	T	P	C
SDG : 9		3	0	0	3

COURSE OBJECTIVES :

COB1: The objective of the course is to understand about the Internet in advertising and the process of selling in online through advertisements.

COB2: Develop, evaluate, and execute a comprehensive digital marketing strategy and plan.

COB3: Provides an understanding of the ever evolving digital landscape that examines the strategic role of digital marketing processes and tools in designing the overall Marketing strategy.

COB4: Familiarise about the methodologies, tools and technologies involved in digital marketing and Explore the latest digital ad technologies.

COB5: Develop the skill which enables to design the promotion strategies as well as to gain knowledge about the current trends in marketing that empower to pursue the careers in the Digital Marketing area.

MODULE I INTRODUCTION TO INTERNET ADVERTISING 09

Internet advertising – Definition – Benefits of Online advertisement – Types of Online Advertising –Online Ad Models – Online advertising markets –Interstitials Ads –Developments and advancements in E-mail Marketing – Mapping industry trends –case studies of digital strategy.

MODULE II SEARCH ENGINE OPTIMIZATION(SEO) 09

SEO fundamentals– Need for SEO – Difference between portal and search engines –SEO techniques (On page and Off page) – SEO Keyword analysis – Meta Tags and Meta Description, Website Content Optimization –Introductions on Search Engine Algorithms – Optimizing with Google Algorithms – Google webmaster tool –Measuring SEO Efficacy.

MODULE III SOCIAL MEDIA MARKETING (SMM) 09

Definition of Social Media Marketing & Social Media – Identifying Goals for Social Media Marketing such as eWOM, Customer Evangelists – Facebook Marketing – LinkedIn Marketing –YouTube Marketing –Twitter, Instagram, and Pinterest Marketing – Google plus marketing – Social Media Analytical Tools.

MODULE IV SEARCH ENGINE MARKETING (SEM)**09**

Introduction to SEM–Effective Ad Campaign Creation –Overview of Google Adwords, Microsoft AdCenter and Yahoo Search–Use of Different Social Media Platforms– Strategizing PPC Campaign –Display advertising techniques, Ad writing Techniques –Demographic Targeting/Bidding – Report generation.

MODULE V TOOLS AND TECHNIQUES**09**

Email Marketing Analytics Tools: Google Analytics– MailChimp–Talkwalker-Followerwonk – Screaming Frog SEO Spider Tool– Conversion Optimization Tools: Hubspot, Lucky Orange, Unbounce–SMM Tools: Tailwind-Sprout Social– SEM Tools: Google Ads, SpyFu.

L – 45 ; Total Hours - 45**TEXT BOOKS:**

1. Joe Plummer, Steve Rappaport, Taddy Hall, and Robert Barocci, The Online Advertising Playbook, John Wiley & Sons, Inc. (Hoboken, New Jersey), 2007.
Gerry T. Warner, Joe Wilson Schaefer, Online Marketing: 2 Books in 1: Social Media Marketing + Content Marketing to Learn Step-by-Step the Best Online Marketing Strategies to Boost Your Business ... (Internet Marketing, Digital Marketing 2019)
- 2.

REFERENCES :

1. RobbinZeff and Brad Aronson (ZA book from here on), Advertising on the Internet, 2nd edition, John Wiley & Sons, Inc. (New York, NY), 1999.
2. A.J. O'Brien, Online Marketing Millionaire: Affiliate Marketing Top 10 Programs You Can Make Money Online with Today (Book 2 of Series)

COURSE OUTCOMES :

Students who complete this course will be able to,

CO1: develop, evaluate, and execute a comprehensive digital marketing strategy and plan.

CO2: provide an understanding of the ever evolving digital landscape that examines the strategic role of digital marketing processes and tools in designing the overall Marketing strategy.

CO3:familiarise about the methodologies, tools and technologies involved in digital marketing and Explore the latest digital ad technologies.

CO4: develop the skill which enables to design the promotion strategies as well as to gain knowledge about the current trends in marketingthat empower to pursue the careers in the Digital Marketing area.

Board of Studies (BoS):

16thBoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1							H							
CO2				L			M			H		M	L	M
CO3				H	H			M					M	
CO4			H		H			L	H		H	H	M	
CO5						L	H	L			H	H	H	H

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 9 : Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The learner would be able to develop the relevant theories, practice, digital ads, legal issues, ethical challenges in the fields of advertising and marketing communication. The outcomes of the course would enable the learner to Develop advertising media with productive buying and innovative planning strategies with computational knowledge and multimedia intelligence.

CADX254	PHP PROGRAMMING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to

COB1: learn how to build good web applications using PHP language.

COB2: install PHP and work with arrays and regular expressions.

COB3: ability to handle the exceptions and sessions.

COB4: to perform fundamental database operations.

COB5: understand the frameworks for easy debugging process.

MODULE I INTRODUCTION TO PHP 9

PHP installation and Introduction, Syntax, Variables – Data types – Operators and expressions – Decisions and Loops – Function – Arrays with attributes – Creating and String – String related Library functions – Regular Expressions.

MODULE II PHP FORMS AND IMAGES 9

Form Handling–PHP Interactive Forms- PHP GET & POST-Form Validation- PHP Form sanitization- PHP Form URL/ E-mail–Basics of Computer Graphics- Creating Image- Manipulating Image-Using Text in Image- Watermarks to Image.

MODULE III ADVANCED PHP 9

Introduction to OOPS – Class – methods-Constructors and Destructors, Access Modifiers – Inheritance-Abstract class – Interface-Error and Exceptional Handling-File Handling-PHP date and time-PHP Session Handling.

MODULE IV PHP WITH MYSQL 9

Database Basics-Connection with My SQL database-My SQL Create – database- My SQL Create Table- Basic operations: Insert, Update, Select, Retrieve, Delete -Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.

MODULE V PHP WITH MYSQL 9

Web Development Frameworks – Introduction –Yii Fundamental concepts ofYii– PHPXMLParsers –PHPXMLExpat – PHPXMLDOM-Ajax PHP-PHPMail.

L – 45 ; Total Hours - 45

TEXTBOOK:

1. KevinTatroe,Peter MacIntyre,RasmusLerdorf,“Programming PHP”,Creating Dynamic Web Pages,O'Reilly Media,3rd Edition,2013

REFERENCES:

1. Luke Welling, Laura Thomson, “PHP and MySQL Web Development (Developer's Library) 5th Edition”
2. <http://php.net>
3. <http://www.tutorialspoint.com/php/index.html>

COURSE OUTCOMES:

CO1: Design a web project to use real-time processing capabilities to interact with a database.

CO2:Test and debug PHP application.

CO3:Apply the Model View controller pattern or web applications.

CO4:Pass information from client browser to webserver for transactionprocessing.

CO5:Work withhigh- performance PHPframework for developing Web2.0 applications.

Board of Studies (BoS) :

BoS was held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1						M	L		M			H	H	H
CO2														H
CO3				H				M						
CO4				H										M
CO5					M						M	H		H

Note:L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9:Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainableindustrialization and foster innovation.

The learner would be able to develop web applications and build the computerized ecosystem for the enterprise in a cost effective manner. The outcomes of the course would enable the learner to be productive in industrialization process with innovative computerization ideas.

CADX 255	FUNDAMENTALS OF BLOCKCHAIN	L	T	P	C
SDG: 9	TECHNOLOGY	3	0	0	3

COURSE OBJECTIVES:

COB1: Introduce the basic concepts of Blockchain technologies.

COB2: Explore the fundamental concepts of cryptography and consensus mechanism.

COB3: Stimulate the knowledge on crypto currencies and bitcoins.

COB4: Analyse on various Blockchain tools for extracting useful and relevant insights.

COB5: Illustrate on various application domains on Blockchain for exploring various aspects of Blockchain technology.

MODULE I INTRODUCTION 9

Overview: Objectives, Features, Terminologies, Uses –BlockchainTypes - Blockchain Structure: Transactions, Working Principles of Blockchain Technology - Pros and Cons of Blockchain - Tiers of Blockchain technology - Permissionless and Permissioned Blockchain .

MODULE II CRYPTOGRAPHY IN BLOCKCHAIN 9

Distributed Ledger Technology – Digital Signatures – Hashing – Cryptography and Hash Function – Merkle tree and Merkle root in a block – Symmetric and Asymmetric Encryption – Consensus Algorithms – Proof of Work - Hash Generator - Peer to Peer Network - Non Fungible Token(NFT).

MODULE III CRYPTOCURRENCIES 9

Transformation in trading units - Cryptography and Cryptocurrency - Anonymity and Pseudonymity in Cryptocurrencies - Cryptocurrency Hash codes -Distributed Networks - Decentralized applications - Bitcoin: History, usage, buying and selling, storing - Bitcoin transactions: Parameters -Roles in bitcoin ecosystem.

MODULE IV BLOCKCHAIN TECHNOLOGY PLATFORM 9

Design methodology for Blockchain applications –Fundamentals of Ethereum - Solidity – Hyperledger: Writing Smart Contract using Hyper ledger Fabric – Truffle – Remix IDE – MetaMask – Geth – Mist – Ganache.

MODULE V APPLICATIONS**9**

Manufacturing and Production - Supply Chain Management - Internet of Things - E-voting - Healthcare - Land Registry - Capital Market Knowledge and Innovation Management - Decentralized Fleet Tracking System - Real World Case Study: Banking system - Adhaar card on Blockchain.

L - 45; TOTAL HOURS - 45**TEXT BOOKS:**

1. Bahga A., MadisetiV., "Blockchain applications: a hands-on approach", VPT, 2017.
2. Makoto Yano, Chris Dai, Masuda, Kishimoto, "Blockchain and Cryptocurrency", Frist edition, Springer, 2020.
3. EladElorm, "The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects", Apress, 2019.

REFERENCES:

1. VikramDhillon, David Metcalf and Max Hooper, "Blockchain enabled Applications", A press, 2017,
2. B. Mahadevan, Operations Management Theory & Practice, Pearson, 3rd edition, 2015.
3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015.

COURSE OUTCOMES:

CO1: Understand the working of Blockchain technology.

CO2: Design the requirement engineering metrics for the system to integrate block chain technologies.

CO3: Apply Blockchain applications, such as bitcoins in solving real-world problems.

CO4: Interpret the results and recommend possible actions for real worlds problems using Blockchain tools.

CO5: Develop various business models with Blockchain integration.

Board of Studies (BoS):20th BoS of CA held on 17.05.2024**Academic Council:**22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	M												L	
CO2	H												M	
CO3	L										M		H	
CO4		L	M	M	H	H			L		H	M		M
CO5		H	M	H	M		H	H	M		L	H		H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure

Statement: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. The cognitive learning objectives, socio-emotional learning objectives and behavioral learning objectives are achieved in the course outcomes as the learner would be able to design the requirement engineering metrics for the cryptocurrency system, evaluate the business models performance and optimize it innovatively with block chain integration.

CADX 256 INTRODUCTION TO DATA ANALYTICS L T P C
SDG: 9 3 0 0 3

COURSE OBJECTIVES:

COB1: Provide basic knowledge on Data Analytics and Visualization.

COB2: Inculcate statistical analysis techniques to interpret data insights.

COB3: Expose the predictive data analytics techniques.

COB4: Know the concept of Data mining and Data warehousing.

COB5: Impart proficiency to use the Data Analytics tool .

MODULE I INTRODUCTION 9

Overview – Significance– Types of Data Analytics– Data Analytics Lifecycle – Data Pre-Processing : Data Cleaning & Handling Missing Data, Outliers -Data Analytics Methods and Techniques – Analytics tools –Applications - Data Visualization: Data Dashboards -Types of Charts: Bar Chart ,Stacked Bar Chart , Line Chart , Histogram , Box Plot, Statistical Quality Control.

MODULE II STATISTICAL ANALYSIS 9

Descriptive Statistics - Categories of Data : Qualitative and Quantitative - Levels of Measurement -Normal Distribution -Measures of central tendency - Measures of dispersions - Hypothesis Testing : t-test, z-test, F-test , Chi-Square test ,One way ANOVA.

MODULE III PREDICTIVE DATA ANALYTICS 9

Regression: Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Support Vector Machine Regression- Classification: Decision Trees, Random Forest, K Nearest Neighbour Algorithm , Naïve Bayes, Support Vector Machine classifier -Clustering: Hierarchical Clustering Methods - K-Means Clustering - Market Basket Analysis.

MODULE IV DATA MINING AND DATA WAREHOUSING 9

Data Mining: Gathering and selecting data, Data cleansing and preparation, Outputs of Data Mining, Evaluating Data Mining Results, Data Mining Techniques, Tools and Platforms for Data Mining - Data Warehousing: Data Warehousing Architecture - Data Sources - Data Loading Processes - Data Warehouse Design.

MODULE V DATA ANALYTICS TOOL**9**

Spreadsheet Principles and Screen Layout - Functions - Logical, Mathematical, Text, Date and Time- Tables: V Look Up, H Look Up- Charts - Pivot Tables - Sort – Filter- Conditional Formatting :What-If Analysis-Solver Analysis ToolPak.

L – 45; TOTAL HOURS – 45**TEXT BOOKS:**

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Introducing Data Science, Manning Publications Co., 1st edition, 2016.
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 1st edition, 2013.
3. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley, 2021.
4. D J Patil, Hilary Mason, Mike Loukides, Ethics and Data Science, O' Reilly, 1st edition, 2018.

REFERENCES:

1. Dr Anil Maheshwari, Data Analytics Made Accessible, Publisher: Amazon.com Services LLC,2018.
2. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly, 1st edition,2015.
3. Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline, O' Reilly,1st edition, 2013.
4. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2nd edition, 2014.
5. Eric Siegel, Predictive Analytics The Power to Predict Who Will Click, Buy, Lie, or Die, 2nd Ed., Wiley.

COURSE OUTCOMES:

CO1: Understand the different types of data analytics.

CO2: Apply descriptive statistics and hypothesis testing techniques effectively.

CO3: Develop and analyze various Machine learning algorithms.

CO4: Demonstrate proficiency in data loading processes and data warehouse efficiently.

CO5: Utilize appropriate functions and features for data analysis tasks.

Board of Studies (BoS):

20th BoS of CA held on 17.05.2024

Academic Council:

22nd ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			M										H	
CO2					H								H	
CO3				H	M								M	
CO4			M						H				H	
CO5									M		M		H	H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

Resilient infrastructure forms the backbone for the storage, processing, and transmission of vast amounts of data essential for analytics. Moreover, promoting inclusive and sustainable industrialization fosters the development of industries that generate data, providing valuable insights for decision-making and innovation. By investing in robust infrastructure and fostering innovation, countries can enhance their capabilities in data analytics, leveraging techniques ranging from statistical analysis to data mining and visualization. This enables informed decision-making, drives economic growth, and facilitates the achievement of sustainable development goals by harnessing the power of data to address societal challenges effectively.

PROGRAMME ELECTIVE II

CADX150	HEALTHCARE ANALYTICS	L	T	P	C
SDG: 3		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the health data formats, health care policy and standards.

COB2: Understand the health data management frameworks.

COB3: Learn the significance and need of data analysis.

COB4: Learn the use of analytics techniques in healthcare.

COB5: Apply healthcare analytics for critical care applications.

MODULE I INTRODUCTION 9

Overview - History of Healthcare Analysis-Advanced computing technology- Roles of Healthcare analytics in medical care- outcomes, Lower costs, Ensure quality – Foundations of healthcare Analytics, Healthcare Mathematics, Computer Science- Examples of Healthcare Analytics.

MODULE II HEALTHCARE STANDARDS 9

Healthcare delivery in the US - Healthcare industry basics - Healthcare financing – Healthcare policy - Protecting patient privacy and patient rights - Advancing the adoption of electronic medical records - Promoting value-based care - Advancing analytics in healthcare - Patient data – Journey from patient to computer.

MODULE III HEALTHCARE DATA MANAGEMENT SYSTEM 9

Healthcare database management system - Data engineering with SQL – an example -Case details – Prediction mortality(cardiology/diabetes)- Clinical database- SQLite- Data engineering

MODULE IV ANALYTICS TECHNIQUES 9

Model frameworks for medical decision making - Tree-like reasoning - Probabilistic reasoning and Bayes theorem - Machine learning algorithm – Naive Bayes Classifier - Criterion tables and the weighted sum approach.

MODULE V FUTURE EMERGING TECHNOLOGIES AND CASE STUDIES 9

Future – Healthcare and Emerging Technologies - Healthcare analytics and the internet - Healthcare and deep learning–Obstacles - Ethical issues, and limitations–Case Study: Smart Ambulance System using IOT - Hospital Acquired Conditions (HAC) program - ECG Data Analysis.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 1st Edition, UK, 2018.

REFERENCES:

1. NilanjanDey, Amira Ashour, Simon James Fong, ChintanBhatl, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
2. Kulkarni, Siarry, Singh,Abraham, Zhang, Zomaya, Baki, "Big Data Analytics in HealthCare", Springer, 2020.

COURSE OUTCOMES:

CO1:Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications

CO2:Apply the data management techniques for healthcare data

CO3:Design health data analytics for real time databases.

CO4:Use of analytics techniques for healthcare dataanalysis.

CO5:Design emergency care system using health data analysis

Board of Studies (BoS) :

19th BOS was held on 13.02.2023.

Academic Council:

20thmeeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		M											M	
CO2				L										
CO3						M								
CO4					H									H
CO5				H										M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG No.3: Ensure healthy lives and promote well-being for all at all ages.

Statement: The learner understands the socio-political-economic dimensions of health and well-being and knows about the effects of advertising and about strategies to promote health and well-being.

CADX151	AGILE METHODOLOGY	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the theoretical and practical development of agile methodology software development.

COB2: Describe several agile process and design for software development.

COB3: Analyze agile knowledge management and access implications of Testing.

COB4: Learn about requirement process importance of RE to develop software and DevOps for CI/CD using containers, container orchestration and pipelines.

COB5: Estimate in an incremental and iterative fashion using practical techniques.

MODULE I FUNDAMENTALS OF AGILE METHODOLOGY 9

The genesis of agile - Need of agile software development, agile context - Agile Manifesto, Principles, Roles, Artifacts and Challenges - Traditional Model vs. Agile Model – Various Agile Methodologies, Project Management, Team Interactions - Agility in Design, Testing, Documentations – Agile Drivers, Capabilities and Values.

MODULE II AGILE PROCESSES AND DESIGN MODELS 9

Overview of Agile Process: SCRUM, XP, Lean and Kanban- Scrum: Scrum process, roles - Product Owner, ScrumMaster, Team, Project Manager, product manager, architect, events. Feature Driven Development- Lean Software Development- Extreme Programming: Method Overview, Core principles, values and practices – Lifecycle – Work Products.

MODULE III KNOWLEDGE MANAGEMENT AND TESTING 9

Agile Information Systems - Decision Making – Institutional Knowledge Evolution Cycle-Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Role of Story-Cards – Story-Card Maturity Model (SMM)-Testing: The Agile lifecycle and its impact on testing, Test driven development – Acceptance tests and verifying

stories, writing a user acceptance test, Developing effective test suites, UI, Security Testing, Code refactoring. Risk based testing, Regression tests, Test automation.

MODULE IV REQUIREMENTS ENGINEERING AND TOOLS 9

Overview of RE Using Agile: Impact of Agile Processes in RE–Current Agile Practices–Agile Requirements: User personas, story mapping, user stories, 3Cs, INVEST, acceptance criteria, sprints, requirements, product backlog and backlog grooming- Tools: Agile tracking tools such as JIRA; Scaled agile frameworks: SAFe, Scrum@Scale, Disciplined Agile.

MODULE V CASE STUDY OF AGILE PROJECT DEVELOPMENT 9

DevOps: Continuous Integration and Continuous Delivery CI/CD: Jenkins Creating pipelines, Setting up runners Containers and container orchestration (Docker and Kubernetes) for application development and deployment; Checking build status; Fully Automated Deployment; Continuous monitoring with Nagios; Introduction to DevOps on Cloud.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Roman Pichler, Agile Product Management With Scrum, 2021
2. Hazza and Dubinsky, Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.

REFERENCES:

1. Ken Schwaber and Jeff Sutherland, The Scrum Guide, 2020.
2. Craig Larman, —Agile and Iterative Development: A Manager's Guidell, Addison-Wesley, 2004.
3. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Managementll, Butterworth-Heinemann, 2007.

COURSE OUTCOMES:

CO1: Be able to compare and contrast the differences between Agile and other project management methodologies.

CO2: Ability to interpret and apply various principles, phases and activities of the Scrum methodology

CO3: Realize the importance of interacting with business stakeholders in determining the requirements and explore iterative software development processes for a develop software system.

CO4: Develop techniques, tools and improving team collaboration for develop software quality.

Perform Software process improvement as an ongoing task for development teams.

CO5:Implement DevOps principles for CI/CD.

Board of Studies (BoS) :

Academic Council:

19th BOS was held on
13.02.2023.

20th meeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		M											M	
CO2				L										
CO3						M								
CO4					H									H
CO5				H										M

SDG 9:

Elevate stable, comprehensive, and sustainable economic growth, full and productive employment, and decent work.

Statement:

By learning “Agile Methodologies”, the students will be able to perform large-scale analysis, lead time, measure the team’s performance, identify bottlenecks and make data-driven decisions, promotes a collaborative, iterative, and incremental approach to project management. Hence it develops economic sustainability and enormous employment opportunities.

CADX 152	HUMAN RESOURCE	L	T	P	C
SDG: 9	ANALYTICS	3	0	0	3

COURSE OBJECTIVES:

COB1: Inferring various concepts of human resource analytics.

COB2: Analyzing the fundamental concepts of HR analytics with predictive analytics.

COB3: Stimulate the knowledge on measures, models and framework.

COB4: Correlate with software tools and data visualization tools for dashboards and scorecards.

COB5: Moderate on various techniques for analysing case studies to extract useful predictions.

MODULE I HUMAN RESOURCE PERSPECTIVE 9

Fundamentals of HR- Strategic Role of HR- HR Decision Making - Role of Analytics, Defining HR Analytics - Current approaches on: HR measuring and reporting value - Strategic HR Metrics versus Benchmarking - HR Scorecards & Workforce Scorecards - HR Maturity Framework.

MODULE II HR MEASUREMENT 9

Need for HR Measurement - HR Analytics and business linkages - Prerequisites of HR Analytics - Models and frameworks of HR Analytics - Role of social media, Big Data and Predictive Analytics in HR – Assessing the effectiveness of HR Analytics - Post analysis steps, Review and monitoring, Issues in HR valuation and measurement.

MODULE III HR ANALYTICS AND PREDICTIVE ANALYTICS 9

Basics of HR Analytics - Evolution, Analytical capabilities and Analytic value chain, Analytical Model - Typical application of HR analytics - Predictive Analytics: Steps involved in predictive analytics - determine key performance indicator, analyze and report data, results interpretation and prediction - Metrics and Regression analysis.

MODULE IV HR DASHBOARDS AND SCORECARD 9

Statistical software used for HR analytics: MS-Excel, IBM- SPSS, Power BI and R programming - Data visualization tools: Tableau, Plotly, Click view and

Fusion Charts - Creating HR Scorecard - develop an HR measurement system
- guidelines for implementing a HR Scorecard.

MODULE V HR ANALYTICS CASE STUDY 9

Coca - Cola Enterprises (CCE) – Nielsen: keeping key talent - Flight risk at IBM – HR driving store performance –CISCO: opening new office - Unilever: automated listening during a hostile takeover - Johnson & Johnson: Experience and retention.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. McFarlane, Lindsay, et al, “The Practical Guide to HR Analytics: Using Data to Inform, Transform, and Empower HR Decisions”, United States, Society for Human Resource Management, 2018.
2. Edwards, Martin R., and Kirsten Edwards, “Predictive HR analytics: Mastering the HR metric”, Kogan Page Publishers, 2019.

REFERENCES:

1. Person, Ron, “Balanced scorecards and operational dashboards with Microsoft Excel”, John Wiley & Sons, 2013.
2. <https://www.aihr.com/blog/hr-analytics-case-studies>

COURSE OUTCOMES:

CO1: Describe the various techniques for analyzing HR management to extract useful and relevant insights.

CO2: Apply the techniques to address the challenges in HR analytics.

CO3: Elucidate and pertain suitable HR analytics techniques in solving real-world problems.

CO4: Interpret the results and recommend possible actions from analytics performed using various tools.

CO5: Perceive on HR responsibility and demonstrate the value in business terms.

Board of Studies (BoS) :

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on 13.4.23.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	M						H	L			L	M		
CO2	H	L						H						M
CO3				L			M				M			
CO4			M		H								H	
CO5			H			L			M				L	

SDG 9:

Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

The course is an application oriented one and most of the exercises have to be done with case studies and examples. During the course basic concepts regarding HR metric will be revised and applied using organizational data. Remembering the basic concepts both conceptual and empirical, understands them thoroughly in terms of their application. Apply the same in your own develop models (descriptive, or predictive analytics) and type of tools or methods to be used. Analyze the model meticulously and interpret it with proper meaning by which it would be realistic to help making a decision.

CADX153	WEB MINING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Introduce the basic concepts and techniques of Information Retrieval and Web Search.

COB2: Learn the web structure and usage patterns.

COB3: Understand the various aspects of web usage mining.

COB4: Develop skills in using appropriate tool for web mining.

COB5: Gain knowledge on web mining techniques for extracting knowledge from real world web data.

MODULE I INTRODUCTION 9

A brief history of the Web and the Internet – Web Data Mining – Information retrieval and Web search: Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing - Supervised and Unsupervised Learning

MODULE II WEB STRUCTURE MINING 9

Breadth-First/Depth-First crawlers – Universal crawlers - Social Network Analysis – Page Rank – HITS – Community Discovery - Automatic Wrapper Generation - String Matching and Tree Matching - Extraction Based on a Single and Multiple List Pages.

MODULE III WEB USAGE MINING 9

Data Collection and Pre-Processing - Association Rules and Sequential Patterns -Data Modeling for Web Usage Mining – Web Usage Pattern Analysis and Discovery - Recommender Systems and Collaborative Filtering – Query Log Mining.

MODULE IV WEB MINING TOOLS 9

Web data extraction using Octoparse – Web log mining using WEKA – Classification and Clustering of web documents using WEKA / R – Web Scraping using R / Python.

MODULE V APPLICATIONS AND CASE STUDIES 9

Implementing a Web Crawler - Building a Text Classifier to classify emotions - Opinion Spam Detection in online reviews - Mining usage patterns of electronic commerce website.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", Springer, Second Edition, 2012.
2. Luís Torgo, "Data Mining with R - Learning with Case Studies", CRC Press, Second Edition, 2017.

REFERENCES:

1. Guandong Xu, Yanchun Zhang, Lin Li, "Web Mining and Social Networking - Techniques and Applications", Springer, 2017.
2. Matthew A. Russell and Mikhail Klassen, "Mining the Social Web", O'Reilly Media, Inc., Third edition, 2019.
3. Neha Gupta, Rashmi Agrawal, "Uncovering the Pattern in Web using Data Mining", Pacific Books International, 2019.
4. Federico Alberto Pozzi, Elisabetta Fersini, Enza Messina and Bing Liu, "Sentiment Analysis in Social Networks", Morgan Kaufmann, 2017.

COURSE OUTCOMES:

CO1: Explain various Information Retrieval techniques that can be used on web data.

CO2: Perform analysis on web structure and its content.

CO3: Identify and extract usage patterns from web.

CO4: Use various tools for web data mining.

CO5: Design a system to extract information and discover pattern on the web.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		L	M		L								M	
CO2			M	M									L	
CO3		M	H										M	H
CO4					H								L	H
CO5		M	M	M	L								M	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The techniques taught to the learner in this course will help them discover patterns from the World Wide Web. The patterns discovered can be used by industries to analyze trends and facilitate more effective E-services, enhance web design, introduce personalization service and provide more effective browsing.

CADX154	HUMAN COMPUTER	L	T	P	C
SDG: 9	INTERACTION	3	0	0	3

COURSE OBJECTIVES:

COB1: Learn the foundations of HCI.

COB2: Understand the interactive design patterns.

COB3: Identify the stages in software engineering models for effective interaction with computers.

COB4: Discover the various models that can be used for designing System.

COB5: To learn the guidelines for user interface.

MODULE I FOUNDATIONS OF HCI 9

Human: I/O channels – Memory – Reasoning and problem solving – Computer: Devices – Memory – Processing and networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements; Design of Interactive systems – Text entry devices – Display devices for virtual reality and 3D interactions – Sensors and special devices.

MODULE II DESIGN & SOFTWARE PROCESS 9

Interactive Design: Basics – Process – Scenarios – Navigation – Screen Design – Iteration and prototyping– HCI in software process: Software life cycle – Usability engineering – Prototyping in practice – Design rationale – Design rules: Principles – Standards – Guidelines – Rules – Evaluation Techniques – Universal Design.

MODULE III SOFTWARE TOOLS AND MECHANISM 9

Programming Tools – Windowing systems – Interaction tool kit –Evaluation techniques – Evaluation Design – Evaluating implementations – Observational Methods – Text and messages –Icons – Multimedia – Colors – Uses problems – Choosing colors.

MODULE IV MODELS AND THEORIES 9

HCI Models: Cognitive models: Socio-Organizational issues and Stakeholder requirements – Hierarchical model – Linguistic model Communication and collaboration models – Hypertext – Multimedia and WWW – Task models – Task analysis and design – HAX Toolkit.

MODULE V WEB INTERFACE DESIGN 9

User Interface Design – User interface design principles – Interface Components – Drag & Drop – Direct Selection – Contextual Tools –

Overlays – Inlays and Virtual Pages – Process Flow – Process Flow Patterns
– Case Studies.

L – 9; TOTAL HOURS –45

TEXT BOOKS:

1.Human-Computer Interaction – User Centric Computing for Design, Dr. Samit Bhattacharya A, MC Graw Hill India,January 2019.

REFERENCES:

1. Human Computer Interaction A Complete Guide, 2020 Edition, Gerardus Blokdyk,5 STAR Cooks (February 15, 2021).
2. Learn Human-Computer Interaction: Solve human problems and focus on rapid prototyping and validating solutions through user testing Paperback – Import, Christopher Reid Becker,Packt Publishing Limited, September 2020
3. Interaction Design, 5th Edision, Helen Sharp, Jennifer Preece , Yvonne Rogers, Wiley Publications, 2019.
4. The Wiley Handbook of Human Computer Interaction Set Hardcover – 2, Kent Norman, JurekKirakowski, Wiley Publications March 2018.
5. Dream tech Interaction Design, Prece, Rogers Wiley Publications, 2011.

COURSE OUTCOMES: On completion of this course, students will

CO1: Enumerate the basic concepts of human computer interactions.

CO2: Create and Analyze the process of human computer interaction.

CO3: Design the various human interaction models and components.

CO4: Apply the interface design standards / guidelines for evaluating the developed interactions

CO5: Develop meaningful user interface.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20thmeeting of AC held on 13.4.23.

	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	L													
CO2		L			H			H	H				L	
CO3	H	H	H			H	H		M			H	H	
CO4	M				M								H	M
CO5			M		L	H			M				M	H

SDG 9:

Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement:

Business Intelligence concepts and tools were taught in the course. By understanding the concepts and working with case studies the student will be

able to analyze large amount of data according to user queries, drag and drop reports and dashboards much more quickly and accurately which enables to take better decision to the future Industrial and infrastructural projects.

CADX 155	ARTIFICIAL INTELLIGENCE	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basics of Artificial Intelligence and about intelligent agents.

COB2: Learn to apply problem solving strategies to common AI applications.

COB3: Familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation

COB4: Know the AI agents and explore the AI tools & Libraries.

COB5: Study the AI based applications & its features.

MODULE I INTRODUCTION 9

Introduction– Agents Environment – Future of Artificial Intelligence – Properties of Search Algorithm – Types of Search Algorithm - Characteristics of Intelligent Agents– Typical Intelligent Agents.

MODULE II SEARCH METHODS AND TECHNIQUES 9

Problem solving Methods – Uninformed: Breadth First Search – Depth First Search – Depth Limited Search – Uniform Cost Search Algorithm – Bidirectional Search Algorithm – Informed : Greedy Search – A star – AO Star - Heuristics - Constraint Propagation – Backtracking Search.

MODULE III KNOWLEDGE BASED AGENTS 9

Propositional Logic – Wumpus World Problem - First Order Logic – Atomic Logic – Quantifiers in AI – Inference – Unification Algorithms - Forward Chaining - Backward Chaining – Resolution – AI Techniques – Game Playing.

MODULE IV SOFTWARE AGENTS & TOOLS 9

Architecture for Intelligent Agents – Agent communication – Natural Language Processing - Expert Systems – Inductive Learning – Decision Tree Learning - Scikit Learn – Numpy – SciPy Libraries – Tensorflow – AI foundation- Installation – Visualization – Regression – Theano&Keras – Exploration of basics.

MODULE V APPLICATIONS 9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Robot –

Hardware – Perception – Planning – Moving and characters - Using word embeddings – Speech Recognition .

L – ; TOTAL HOURS – 45

TEXT BOOKS:

1. Daugherty, Paul R., and H. James Wilson. "Human+ machine: reimagining work in the age of AI", Harvard Business Press, 2018.
2. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.

REFERENCES:

1. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
2. Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013.
3. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
4. Kaplan, Jerry. "Artificial intelligence: What everyone needs to know", Oxford University Press, 2016.
5. Ivan Bratko : "Prolog Programming For Artificial Intelligence" , 2nd Edition Addison Wesley.

COURSE OUTCOMES:

CO1: Deploy the basics of AI and AI agents in real-time scenario.

CO2: Practice and analyze the various problem solving methods in AI.

CO3: Apply the knowledge representation techniques to study and solve the problem.

CO4: Use the insights of AI agents and AI tools to evaluate the problem.

CO5: Study and implement the various applications of AI.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20th meeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1			M										H	
CO2					H								H	
CO3				H	M								M	
CO4			M						H				H	
CO5									M		M		H	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4:

Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement:

The Basics of AI were taught in this course. Understanding the insights and importance of AI will motivate the student to deploy the AI based business applications in real-time scenario. The knowledge attained through AI will improve the skills set of the student to meet industrial demand in AI domain.

CADX 156	FUNDAMENTALS OF DATA SCIENCE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Understand the basic concepts of Data Science.

COB2: Impart necessary knowledge of the mathematical foundations.

COB3: Understand the basic concepts of Machine Learning.

COB4: Learn the tools to implement Data science and its application.

COB5: Apply the tools of Data science application through case studies.

MODULE I INTRODUCTION TO DATA SCIENCE 9

Overview of Data Science and Its Importance - History and Development - Basic framework and architecture – Evolution - Roles - Primary components - Users and its Hierarchy Model - Big Data Analytics, Business intelligence vs Big data - Big data frameworks - Current landscape of analytics -Data Visualisation techniques - Visualisation software.

MODULE II MATHEMATICAL FOUNDATIONS 9

Linear Algebra: Vectors - Matrices - Statistics: Single Set of Data- Simpson's Paradox - Correlation - Probability: Dependence and Independence - Conditional Probability - Bayes Theorem - Random Variables - Continuous Distributions - Normal Distribution - Central Limit Theorem.

MODULE III MACHINE LEARNING TECHNIQUES 9

Overview of Machine learning concepts - Types - Linear Regression model assumptions - Classification and Regression algorithms - Naive Bayes - K-Nearest Neighbors - Logistic regression - Support vector machine - Decision tree and Random Forest.

MODULE IV PROGRAMMING TOOLS FOR DATA SCIENCE 9

Tools for Data Science - Toolkits using Python: Matplotlib - NumPy - Scikit-NLTK-Visualizing Data: Bar Charts - Line Charts and Scatterplots - Working with data: Reading Files - Scraping the Web - Using the Twitter APIs.

MODULE V CASE STUDIES AND APPLICATIONS 9

Case studies: Weather forecasting - Stock market prediction - Object recognition - Real Time Sentiment Analysis - Different business intelligence

tools and its crucial role in Data Science - Applications:Healthcare - Business and Education Sectors.

L –45; TOTAL HOURS –45

TEXTBOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media First edition (April 30, 2015).
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics", Wiley, Paperback 2nd edition,(2019).
3. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", O'Reilly Media, 1st Edition, 2017.
4. Igual, Laura, and Santi Seguí. "Introduction to data science." In Introduction to Data Science, pp.1-4.Springer, Cham, 2017.
5. Frank Pane, "Hands on Data Science and Python Machine Learning", Packt Publishers, 2017.

REFERENCES:

1. Stephen Marsland, Machine learning: An Algorithmic Perspective, CRC Press, Second Edition, 2009.
2. Jay Liebowitz, Big Data and Business Analytics, CRC press, 2013.
3. G. Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA, 2016.
4. Ian Good fellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press, First Edition (November 18, 2016)
5. Montgomery, D. C. and G. C. Runger, Applied Statistics and Probability for Engineers, 5th Edition, John Wiley & Sons, Inc., NY, USA, 2011.

COURSE OUTCOMES:

CO1:Explore Data Visualisation concepts in Big-data analytics.

CO2:Demonstrate the understanding of mathematical foundations needed for data science.

CO3:Implement the models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees.

CO4:Build Data science applications using Python based toolkits.

CO5:Implement the tools and techniques of Data science applications.

Board of Studies (BoS):

19th BOS was held on 13.02.2023.

Academic Council:

20thmeeting of AC held on 13.4.23.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1					M		M							
CO2	H		H										M	
CO3				M							M			
CO4	H				H									
CO5					M	M	M				M			

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG No.9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The learner will be able to develop a mechanism for real time problems.

GENERAL / OPEN ELECTIVE COURSES

GEDX 302	AI FOR eCOMMERCE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To apply the deep AI techniques to ecommerce industry

COB2: To analyze the programming fundamentals and methods

COB3: To discuss about machine learning techniques

COB4: To analyze the deep learning techniques

COB5: To identify suitable machine learning technique for various problems

MODULE I AI Transformations in Digital Business 8

AI for eCommerce – Introduction - Data Management Infrastructure - Big Data Overview - Big Data Analysis - Fuzzy Logic and Hybrid Systems - Neural Networks - Natural Language Processing - Building a Successful Electronic Commerce Site and other Management Support Systems: A Life Cycle Approach

MODULE II Foundational Building Blocks: Data Sources and Data Handling with Python 10

Basic language structures, data types, basic operations, conditions, loops, functions and modules - data structure sequence, string, list and tuple – Introduction to Numpy and Pandas - Merge, Concatenate, Combining DataFrames, Reshaping, Pivoting, Duplicates in DataFrames, Mapping, Replace, Rename Index, Binning, Outliers, Permutation, GroupBy on DataFrames - GroupBy on Dict and Series, Aggregation, Splitting Applying and Combining, Cross Tabulation

MODULE III Machine Learning Foundations and Models Across Ecommerce Value Chain 10

Introduction to Machine Learning - Supervised Learning and Linear Regression - Classification and Logistic Regression - Decision Tree and Random Forest - Naïve Bayes and Support Vector Machine - Unsupervised Learning

MODULE IV Deep Learning 10

Introduction to Deep Learning, Bayesian Learning, Decision Surfaces - Linear Classifiers, Linear Machines with Hinge Loss - Optimization Techniques, Gradient Descent, Batch Optimization - Unsupervised Learning with Deep Network - Convolutional Neural Network, Building blocks of CNN

MODULE V Applications of AI 8

Personalized shopping experience - Fighting fake reviews - Inventory management and sales forecasting - Automated customer service and chatbots - AI-powered Customer Relationship Management (CRM) systems - Visual search - Voice search and smart homes integration - Combating counterfeit products

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Alexander Borek, Nadine Prill, "Driving Digital Transformation through Data and AI: A Practical Guide to Delivering Data Science and Machine Learning Products" Kogan Page, 2020
2. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming" O'Reilly, 5th Edition, 2013
3. Sebastian Raschka, Vahid Mirjalili, "Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2" Packt Publishing Ltd, 3rd Edition, 2019

REFERENCES:

1. Geron Aurelien, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" O'Reilly, 2017
2. Eric Matthes, "Python Crash Course: A Hands-On, Project-Based Introduction To Programming", No Scratch Press, 2015
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

COURSE OUTCOMES:

CO1: Describe the different AI techniques for ecommerce industry

CO2: Create programs using various collection data types

CO3: Identify suitable mathematical technique for machine learning problems

CO4: Analyze various algorithms for deep learning

CO5: Adapt suitable techniques for machine learning applications

Board of Studies (BoS) :

23rd BoS of ECE held on
13.07.2022

Academic Council:

19th Academic Council held on
29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	H	H	H	M	L	L	L	M	M	H	H	H	H
CO2	H	H	H	H	H	M	L	L	L	M	M	H	H	H	H
CO3	H	H	M	H	H	M	L	L	L	M	M	L	H	H	H
CO4	H	H	M	H	H	M	L	L	L	M	M	H	H	H	H
CO5	H	H	H	H	H	H	L	L	L	L	M	H	H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Build resilient ecommerce system using signal processing techniques and ML classification techniques.

GEDX 306	BUILDING REPAIR SOLUTIONS	L	T	P	C
SDG: 11		3	0	0	3

COURSE OBJECTIVES: The objective of the course is to impart adequate knowledge on

COB1: materials commonly used in building construction including type of buildings

COB2: cement mortar and cement concrete manufacturing methods including quality control aspects

COB3: physical and chemical deterioration mechanisms acting on buildings in the real time conditions

COB4: materials used for building repair works

COB5: techniques for rehabilitating common distress in buildings

MODULE I MATERIALS FOR CONSTRUCTION AND TYPES OF BUILDINGS 9

Introduction – types of cement, sand and stone chips (coarse aggregate) – basic properties – water for construction – types of steel reinforcement rods & its basic properties – bricks – formation of wall with bricks and solid blocks – types of buildings – classification.

MODULE II MANUFACTURE OF CEMENT MORTAR AND CEMENT CONCRETE 9

Cement mortar – ingredients - mix ratio – manufacturing – application areas, cement concrete – ingredients – design of concrete mix – manufacturing methods – applications areas - quality control procedures, cement mortar and concrete – microstructure – influencing parameters.

MODULE III MAJOR CAUSES FOR BUILDING DISTRESS 9

Durable buildings - definition and significance in the current context, causes for building repairs - physical mechanisms - shrinkage, creep, thermal incompatibility, frost action, erosion, abrasion and fire exposure, chemical mechanisms - carbonation, chloride attack, sulphate attack, acid attack - mechanism of corrosion of steel reinforcement rods in concrete.

MODULE IV BUILDING REPAIR MATERIALS 9

Repair materials - factors influencing selection of repair materials – various stages of concrete repair - importance of surface preparation - bond coat - rust

convertors - rust removers - protective coating to steel rebars - superplasticizers - corrosion inhibitor admixed concrete - micro concrete - polymer modified mortar / concrete - crack sealing compounds - concrete coatings.

MODULE V BUILDING REPAIR TECHNIQUES

9

Overview of repair techniques - techniques for arresting cracks – grouting – guniting and shotcrete – concrete / steel jacketing technique, procedure for arresting leakage and dampness in terrace, washroom and wall areas – case study.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Duggal, S. K., "Building Materials", 4th Edition, New Age International, 2012
2. Gambhir, M.L., "Concrete Technology", 5th Edition, Tata McGraw Hill Education, 2013

REFERENCES:

1. Santha Kumar, A.R., "Concrete Technology", Oxford University Press, New Delhi, 2007.
2. Shetty, M.S., and A.K., Jain "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd., 2010.
3. Brooks, J.J. and Neville, A.M., "Concrete Technology", Pearson, 2019.
4. Kumar Mehta. P. and Paulo J.M. Monteiro., "Concrete: Microstructure, Properties, and Materials" 4th Edition, McGraw Hill Education (India) Pvt. Ltd., 2014.
5. Gambhir, M. L., and Neha Jamwal, Building Materials: Products, Properties and Systems, Tata McGraw Hill, 2017.
6. Raj, P. Purushothama, Building construction materials and techniques, Pearson Education India, 2017.
7. Gahlot, P. S. and Sanjay Sharma, Building repair and maintenance management, CBS Publishers and Distributors, 2019.

COURSE OUTCOMES: At the end of the course, students will be able to

CO1: understand the various materials used for building construction, its properties and significance.

CO2: understand and visualize the manufacture of cement mortar and concrete used in building construction, and relevant quality control aspects.

CO3: recognize the physical and chemical deteriorating mechanisms detrimental to the buildings.

CO4: suggest materials for different repair works in a building.

CO5: identify the suitable repair techniques for rehabilitation of common distress buildings.

Board of Studies (BoS):

18th BoS of CE held on 05.04.2023

Academic Council:

20th Academic Council held on
13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						L	H								
CO2						L	H								
CO3						L	H								
CO4						L	H	M			M				
CO5					H	L	H	M			M				

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

1. Development of sustainable infrastructure by understanding the physical and chemical deteriorating mechanisms during its life time.
2. Make the human settlements safe and resilient by implementing proactive measures for enhancing durability in new construction, and adopting suitable repair materials and techniques for rehabilitation of existing buildings.

GEDX309	CONSUMER ELECTRONICS	L	T	P	C
SDG: 4,9		3	0	0	3

COURSE OBJECTIVES:

COB1: To discuss the fundamentals of audio systems.

COB2: To analyze the video systems and ecommunication systems

COB3: To adapt the fundamentals of electronics in consumer gadgets.

COB4: To compare the difference between CloT and IoT

COB5: To choose the consumer electronics using IoT for an application

PREREQUISITE:

Fundamentals of electronic circuits, communication engineering, microprocessor and microcontrollers.

MODULE I AUDIO FUNDAMENTALS AND DEVICES 9

Basic characteristics of sound signal, Microphone: working principle, sensitivity, nature of response, directional characteristics, Types: carbon, condenser, crystal, electrets, tie-clip, wireless, Loud speaker: working principle, characteristic impedance, Types: electrostatic, dynamic, permanent magnet etc, woofers and tweeters, Sound recording: Optical recording, stereophony and multichannel sound

MODULE II AUDIO SYSTEMS 9

Audio system: CD player, home theatre sound system, Digital console: block diagram, working principle, Applications, FM tuner: concepts of digital tuning, ICs used in FM tuner TDA7021T, PA address system: speaker impedance matching, Characteristics, power amplifier, Specification.

MODULE III TELEVISION SYSTEMS 9

Composite video signal: horizontal and vertical sync details, scanning sequence, Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance, Different types of TV camera, Transmission standards: PAL system, channel bandwidth

MODULE IV TELEVISION RECEIVERS AND VIDEO SYSTEMS 9

PAL-D colour TV receiver, block diagram, Precision IN Line color picture tube. Digital TVs: LCD, LED, PLASMA, HDTV, 3-D TV, projection TV, DTH receiver. Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface, Digital Video Interface, CD and DVD player: working principles, interfaces.

MODULE V CIOT AND ITS CASE STUDIES 9

Introduction to Consumer Internet of Things (CIoT), difference between CIoT and IoT, Application of home appliances, Wearable devices and other case study of consumer electronic equipments.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. R R. GULATI, Modern Television Practice Transmission, Reception and Applications, New Academic Science, 2021
2. Bali S.P., Consumer Electronics, Pearson Education India, 2010, latest edition.

REFERENCES:

1. Bali R and Bali S.P, Audio video systems : principle practices & troubleshooting, Khanna Book Publishing Co. (P) Ltd., Delhi , India, 2010.
2. Gulati R.R., Modern Television practice, New Age International Publication (P) Ltd. New Delhi Year, 2011,
3. Gupta R.G., Audio video systems, Tata Mc graw Hill, New Delhi, India, 2nd edition, 2010.
4. Whitaker Jerry & Benson Blair, Mastering Digital Television: The Complete Guide to the DTV Conversion, McGraw-Hill Professional, 5th edition, 2006.
5. Whitaker Jerry & Benson Blair, Standard handbook of Audio engineering, McGraw-Hill Professional, 2nd edition, 2002.
6. Yashwant Kanetkar, "21 Internet of Things Experiments", Kindle edition, BPB, January 2018
7. Mourade Azrour, Azeem Irshad, Rajasekhar Chaganti, "IoT and Smart Devices for Sustainable Environment", Springer Cham, 2022

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1: Demonstrate the working of audio and television products.

CO2: Select suitable PA system for a specific scenario.

CO3: Apply the troubleshooting procedure of a typical TV receivers and video systems

CO4: Describe the troubleshooting procedure of audio devices

CO5: Illustrate the troubleshooting procedure of a typical TV camera

Board of Studies (BoS) :

23rd BoS of ECE held on
13.07.2022

Academic Council:

19th Academic Council held on
29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	H	L	M	H	L	M	H	M	H	L	M
CO2	H	H	H	L	L	L	M	L	L	L	M	M	H	L	M
CO3	H	H	H	H	L	L	L	M	L	L	L	L	H	H	H
CO4	H	H	H	H	H	L	L	L	L	L	L	L	H	M	H
CO5	H	H	H	H	H	L	L	L	L	H	M	M	M	L	M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote Lifelong learning opportunities for all.

Statement: Provides quality education by understanding the fundamental concepts of home appliances and promotes research in the area of consumer electronic gadgets and electronic communication.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Basic of consumer electronics perseveres on safety measurement of e-gadget used by us. It helps to build resilient Infrastructure; promote inclusive and sustainable industrialization through various electronics appliances used in day to day to life.

GEDX 311	CUSTOMER RELATIONSHIP	L	T	P	C
SDG: 9	MANAGEMENT ANALYTICS	3	0	0	3

COURSE OBJECTIVES:

COB1: Introduce the Basic concepts and definition of CRM analytics.

COB2: Apply the right strategy to customize the CRM module in a Business Application.

COB3: Provide the conceptual understanding of various components of Modules.

COB4: Train the Installation procedure of CRM software and customize for report generation.

COB5: Design the appropriate CRM Module for the business requirement.

MODULE I INTRODUCTION 9

Evolution of Customer Relationship: CRM-Definition - Emergence of CRM Practice - Factors responsible for CRM growth - framework of CRM - Benefits of CRM, Types of CRM, Scope of CRM, Customer Profitability, Features Trends in CRM.

MODULE II CRM STRATEGY 9

Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications - Strategic CRM planning process – CRM Implementation.

MODULE III COMPONENTS OF CRM 9

CRM - Issues and Strategies - CRM as a business strategy - Effective CRM through Customer Knowledge Management - Customer Interaction Management - Call Centre management in CRM. Customer Centricity in CRM- Concept of Customer centricity - Customer Service - Measuring Customer life time value-. Customer life cycle Management.

MODULE IV TECHNOLOGICAL TOOLS FOR CRM IMPLEMENTATION 9

CRM Tools- Analytical CRM – Operational CRM –Sugar CRM (Open Source)

MODULE V CASE STUDIES 9

Implementing CRM in Banking sector – CRM in Insurance - CRM in B2C Market: Telecom – Airlines.

L – 45; Total Hours - 45**TEXT BOOKS:**

1. Jagdish N Sheth, Parvatiyar Atul, G Shainesh, “Customer Relationship Management: Emerging Concepts, Tools and Applications”, 1st Edition, Tata McGraw Hill, June 2017.
2. V. Kumar, Werner Reinartz, “Customer Relationship Management Concept, Strategy and Tools”, 3rd Edition, Springer Texts in Business and Economics, 2018.
3. Francis Buttle and Stan Maklan, “Customer Relationship Management Concepts and Technologies”, 3rd Edition, 2015.

REFERENCES:

1. Ed Peelen and Rob Beltman, “Customer Relationship Management”, 2nd Edition, Pearson Education 2013.
2. Makkar, U. and Makkar, H.K., “Customer Relationship Management”, Tata McGraw-Hill Education, 2012.
3. Alok Kumar, Chabi Sinha, Rakesh Sharma, “Customer Relationship Management: Concepts and applications”, Dreamtech Press, 2007.

COURSE OUTCOMES:

CO1: Define the undertaken CRM problem statement.

CO2: Apply the business strategy and prepare the project proposal for the respective data and technology requirements.

CO3: Integrating the identified CRM Modules.

CO4: Implement the CRM Software modules and generate reports.

CO5: Analyze the generated reports and provide business insights.

Board of Studies (BoS) :

16thBoS of CA held on 23.12.2021

Academic Council:

18th AC held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2
CO1	M	H	H											
CO2		M		H										
CO3														
CO4					H					H			H	H
CO5			H						H	H				H

Note: L - Low Correlation M – Medium Correlation H - High Correlation

SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: The course outcomes are measurable and help the learner to implement CRM solution methodologies to achieve the Sustainable development goal on Industry, Innovation and infrastructure. The proposed CRM solution by the learner would improve the customer retention capacity of the system. The proposed business strategy and innovative application of the tools by the learner would also improve the business profitability.

GEDX 313	DISASTER MANAGEMENT	L	T	P	C
		3	0	0	3

SDG: 3,11,13 & 15

COURSE OBJECTIVES:

The objectives of the course are

COB1:To impart knowledge on the concept related to disaster, hazard and risk.

COB2:To provide an understanding about the types of natural disasters and man-made disasters

COB3:To gain knowledge related to the different impacts of disaster on health and environment

COB4: To provide an understanding about the concept of disaster risk reduction and management

COB5: To provide exposure related to various environmental policies & programs for disaster management

MODULE I BASIC CONCEPTS 7

Concepts and definitions: Disaster, Hazard and its types - Biological, Chemical, Ergonomic, Physical, Psychosocial- Vulnerability and its types –Risks and its types, Factors influencing degree of risk- Risk severity, Frequency and its capacity – Risk impact, prevention, mitigation.

MODULE II TYPES OF DISASTERS 10

Natural hazards and Disasters - Volcanic Eruption, Earthquakes, Tsunamis, Landslides, Cyclones, Floods, Droughts, Cold waves, Heat waves and Fire, Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India - Man-made Disasters - Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, War etc.

MODULE III IMPACTS OF DISASTER 9

Disaster impacts - environmental, physical, social, ecological, economic, political, Health, psycho-social issues, demographic aspects - gender, age, special needs, hazard locations, global and national disaster trends, climate change and urban disasters.

MODULE IV NATURAL DISASTER REDUCTION & MANAGEMENT 10

Disaster management cycle –Disaster preparedness - Early warning systems - Post disaster environmental response (water, sanitation, food safety, waste management,

disease control, security, communications) - Roles and responsibilities of government, community, Local institutions, NGOs and other stakeholders - Applications of Satellite Communications, GPS, GIS and Remote Sensing in disaster management.

MODULE V ENVIRONMENTAL POLICIES & PROGRAMMES IN INDIA 9

Environmental Legislations in India - Environmental policies & programmes-National Disaster Management Authority and its functions - Role of Panchayats in Disaster mitigations - Sustainable rural and urban development- Awareness, Conservation Education & training related disaster management.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Gupta, H.K., “Disaster Management”, University Press, India, 2003.
2. Gupta, M.C., “Manuals on Natural Disaster management in India”, National Centre for Disaster Management, IIPA Publication, New Delhi, 2001.
3. Ghosh G.K., “Disaster Management”, APH Publishing Corporation, 2006.
4. Satish Modh, “Introduction to Disaster Management”, Macmillan Publishers India Limited, 2009.
5. Sulphey, M. M., “Disaster Management”, Prentice Hall India Pvt., Limited, 2016.

REFERENCES:

1. Bhattacharya, T., “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012.
2. Dave, R.K., “Disaster Management in India: Challenges and Strategies”, Prowess Publishing, 2018.
3. Kapur Anu, “Vulnerable India: A Geographical Study of Disasters”, Sage Publishers, New Delhi, 2010.
4. Satender, “Disaster Management in Hills”, Concept Publishing Co., New Delhi, 2003.

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1:Elaborate about the origin, changes and management of environmental hazards.

CO2:Define about the natural disasters and man-made disasters.

CO3: List down the different impacts of disaster.

CO4: Apply the concept of disaster management and relief measures in the real-time situation.

CO5: Suggest solutions based on the National Policy on Disaster Management.

Board of Studies (BoS) :18th BoS of CE held on 05.04.2023**Academic Council:**20th Academic Council held on

13.04.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
CO2	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
CO3	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
CO4	L	-	M	-	M	M	L	L	H	-	-	-	L	-	M
CO5	-	-	M	-	-	M	L	L	-	-	-	-	L	-	M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 3: Ensure healthy lives and promote well-being for all at all ages

SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable

SDG 13 : Take urgent action to combat climate change and its impacts

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Statement:

The knowledge on disaster management can strengthen resilience and adaptive capacity to natural disasters and make cities and human settlements inclusive, safe, resilient and sustainable.

GEDX 320	INDUSTRIAL SAFETY	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To learn the modern safety concepts

COB2: To familiarize with the safety in manufacturing industries

COB3: To acquire knowledge in construction and electrical safety systems

COB4: To be conversant with safety performance monitoring

COB5: To gain knowledge in safety education and training

MODULE I INTRODUCTION TO SAFETY L:7

Evolution of modern safety concept- Safety policy - Safety Organization - Line and staff functions for safety- Safety Committee- budgeting for safety -Safety education and training.

MODULE II SAFETY IN MANUFACTURING L:10

Safety in metal Working-Machine guarding -Safety in welding and gas cutting - Safety in cold forming and hot working of metals -Safety in finishing, inspection and testing – Regulations - Safety consideration in material handling devices: Ropes, Chains, Sling, Hoops, Clamps, Arresting gears – Prime movers.

MODULE III CONSTRUCTIONAL AND ELECTRICAL SAFETY L:10

General safety consideration in Excavation, foundation and utilities – Cordoning – Demolition – Dismantling –Clearing debris – Types of foundations – Open footings.

Electrical Hazards – Energy leakage – Clearance and insulation – Excess energy – Current surges – Electrical causes of fire and explosion – National electrical Safety code.

MODULE IV SAFETY PERFORMANCE MONITORING L:9

Permanent, partial and temporary disabilities - Calculation of accident indices: frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – Problems.

MODULE V SAFETY EDUCATION AND TRAINING L:9

Importance of training - Identification of training needs - Training methods: programme, seminars, conferences, competitions - Method of promoting safe

practice - Motivation – Communication - Role of government agencies and private consulting agencies in safety training: Creating awareness, awards, celebrations, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic safety and training.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Nasser Elahi, "Industrial Safety Management", Kalpaz Publications, 2006.
2. Jain.R.K., Sunil S.Rao. "Industrial Safety, Health and Environment Management Systems" Khanna Publishers, 2000.
3. Accident Prevention Manual, NSC, Chicago, 14th Edition, 2015.

REFERENCES:

1. Fulman, J.B., Construction Safety, Security, and Loss Prevention, John Wiley and Sons, 1979.
2. John Ridley, "Safety at Work", Butterworth & Co., London, 1983.
3. Alexandrov, M.P., Material Handling Equipment, Mir Publishers, Moscow, 1981.
4. Fordham Cooper W., Electrical Safety Engineering, Butterworths, London, 1986.
5. Heinrich H.W. "Industrial Accident Prevention" McGraw-Hill Company, New York, 1980.
6. Blake R.B., "Industrial Safety" Prentice Hall, Inc., New Jersey, 1973.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Describe the modern safety concepts

CO2: Discuss the safety in manufacturing industries

CO3: Elucidate the electrical and construction safety systems

CO4: Illuminate safety performance monitoring

CO5: Explain the safety education and training

Board of Studies (BoS):

20th BOS held on 08.08.2022

Academic Council:

19th Academic Council held on
29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	M			M	L	L				L	L	L
CO2	M	L	M			M	L	L				L	L	L
CO3	M	L	M			M	L	L				L	L	L
CO4	L	L	M			M	L	L		L		L	L	L
CO5	L	L	M			M	L	L	H	L		L	L	L

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Holistic understanding of Industrial safety fundamental norms enhances the safety of men and machines in industries.

GEDX 321	INTERNET OF THINGS AND ITS	L	T	P	C
SDG: 4, 9	APPLICATIONS	3	0	0	3

COURSE OBJECTIVES:

COB1: To explain the fundamental concepts of IoT

COB2: To elaborate the roles of sensors in IoT

COB3: To choose different protocols for IoT design

COB4: To analyze IoT data using various tools

COB5: To illustrate the role of big data and cloud computing in a typical IoT system

PREREQUISITE:

Basics of embedded system and networking

MODULE I FUNDAMENTALS OF IoT 9

Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, , Identifiers in IoT, the Internet in IoT, IoT frameworks, IoT and M2M.

MODULE II IoT PROTOCOLS 9

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols.

MODULE III IoT DEVELOPMENT ENVIRONMENT 9

Sensors: Definition, Types of Sensors and Actuators, IoT Development Boards: Arduino IDE and Board Types, Raspberri Pi Development Kit, RFID Principles and components, introduction to Wireless Sensor Network.

MODULE IV DATA HANDLING & ANALYTICS 9

Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications.

MODULE V APPLICATIONS OF IoT**9**

Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Healthcare and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

L – 45 ; TOTAL HOURS – 45**TEXT BOOKS:**

1. S. Misra, A. Mukherjee, and A. Roy, "Introduction to IoT" Cambridge University Press, 2020
2. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web", Wiley Publications, 2010
3. Olivier Hersent, David Boswarthick, and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", Wiley Publications, 2012
4. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, 2014.

REFERENCES:

1. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Wiley Publications, 2013
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1: Elaborate the various concepts, terminologies and architecture of IoT systems.

CO2: Apply various protocols for design of IoT systems

CO3: Make use of sensors and actuators for design of IoT

CO4: Analyze various techniques of data storage and analytics in IoT

CO5: Develop various applications of IoT

Board of Studies (BoS) :

23rd BoS of ECE held on 13.07.2022

Academic Council:

19th Academic Council held on

29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO2	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO3	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO4	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO5	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No: 4 - Quality Education

Improving lives through the advancement of learning.

SDG No: 9 - Industry, Innovation and Infrastructure

To increase the performance by providing scalable computing and storage resources.

GEDX 325	MOTOR VEHICLE ACTS AND LOSS ASSESSMENT	L	T	P	C
		3	0	0	3

SDG: 9

COURSE OBJECTIVES:

COB1: To understand the structures and function of transport authorities

COB2: To gain knowledge in penalty for offenses

COB3: To gain knowledge in vehicle insurance and policy

COB4: To understand the vehicle impact

COB5: To study the surveying procedure for insurance

**MODULE I INTRODUCTION TO TRANSPORTATION AND
TRANSPORT AUTHORITIES 9**

Functions of Transport Authorities - Key terms used in Motor Vehicle Act- Classification and anatomy of different classes of vehicle - Importance of Permit - Provisions regarding permit - Special Provisions for State Transport Undertakings (STUs)

**MODULE II CONSTRUCTION, MAINTENANCE OFFENCES
AND PENALTY FOR MOTOR VEHICLES 9**

Provisions regarding construction and maintenance of motor vehicles - Preparing rules for various mandatory components to be fitted in a vehicle. Manipulate the maximum limit for speed and weight - Reconstructing provisions for vehicles with left-handed driving vehicles - Planning the rules for driving motor vehicle keeping safety of passengers and occupants a public places - Outlining the punishments for law-breakings.

MODULE III VEHICLE INSURANCE 9

Purpose and need of Insurance- Role in economic development of the country - Insurance legislation and IRDA act - Market Structure - GIC Reinsurance company/ Tariff Advisory Committee - Principle of general insurance - Types of motor vehicle insurance - Types of motor vehicle policies - Zero Depreciation Policy -Terms and Conditions for motor vehicle insurance.

MODULE IV ANALYZING VEHICLE IMPACT 9

Reasons of occurring of accidents - Effect on vehicle during impact from: Any One Side, Head on Collision, Vehicle Topple – underwriting an insurance form – risk assessment in given circumstances

MODULE V SURVEYING AND INVESTIGATING MOTOR VEHICLE CLAIM 9

Surveyor - Licensing authority and controller of insurance - Role of surveyor and loss adjustor - Empanelment of surveyor- Intimation - Site visit - Garage visit – Photography - Estimate and claim form - Passing of estimate - Cost of parts - Cost of repairing – Labour - Checking of documents (Paper pertaining to vehicle) - Important aspects of survey - Various types of loss assessment - Preparation of survey reports and submission - Fraud claims - Connected to Packet Policy- MACT

L 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. R H Prajapati, Motor Vehicle Acts and Loss Assessment”, Atul Prakashan Publications, 1st edition, 2016.

REFERENCES:

2. Hucho.W.H, "The Motor Vehicles Act, 1988 ", Universal/LexisNexis publications, 2021 edition.
3. G.S.Karkaras, "Assessment of Compensation in Accidents under Motor Vehicles Act”, Delhi Law House publications, 2nd edition, 2013. (ISBN-13 :978-8186976708)
4. "The motor vehicles act, 1988”, Asia law house Publishing, 17th edition, 2020. (ISBN-13 : 978-8186976708)
5. Janak Raj jai., "Motor accident claims law and procedure", Universal law publishing, 6th Edition, India, 2016.(ISBN-13 : 978-8186976708)
6. Kannan, Vijayaragavan, "Motor vehicle laws”, 16th edition, 2019. (ISBN:0768082536)

COURSE OUTCOMES:

Students should able to

CO1: Paraphrase Motor Vehicle Acts.

CO2: Examine of Motor Vehicles for Safety and Pollution Control Engineering.

CO 3: Analyze the Penalties related with the Offences and their Procedures.

CO 4: Recognize the types of Motor Vehicle Insurance.

CO 5: Extrapolate the Duties and Responsibilities of Surveyor and Loss Assessor.

Board of Studies (BoS) :

14th Board of Studies held on 22.08.22

Academic Council:

19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PO 12	PSO1	PSO2
CO1	H	L	L	L	L						L	H	H	H
CO2	H	L	L	L	L						L	H	H	H
CO3	H	L	L	L	L						L	H	H	H
CO4	H	L	L	L	L						L	H	H	H
CO5	H	L	L	L	L						L	H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No: 9

The motor vehicle act and the insurance policies are the topics that everyone must be aware of.

Statement:

Better understanding of the insurance claim process is made accessible by having a thorough understanding of motor vehicle act and claim procedure.

GEDX 338	VEHICLE MAINTENANCE	L	T	P	C
		3	0	0	3

SDG: 9

COURSE OBJECTIVES:

COB1: To know about the various methods of maintaining procedure, vehicle insurance and basic problems in a vehicle.

COB2: The student able to impart knowledge in maintaining of engine components and subsystems.

COB3: The student able to impart knowledge in maintaining of transmission, driveline, steering, suspension, braking and wheels.

COB4: The student able to impart knowledge in maintaining of steering, suspension, braking and wheels.

COB5: The student able to impart carefully maintaining their vehicle wiring and air conditioning systems.

MODULE I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS 8

Maintenance – Need, importance, primary and secondary functions, policies - classification of maintenance work - vehicle insurance - basic problem diagnosis. Automotive service procedures – workshop operations – workshop manual – vehicle identification. Safety – Personnel, machines and equipment, vehicles, fire safety - First aid. Basic tools – special service tools – measuring instruments – condition checking of seals, gaskets and sealants. Scheduled maintenance services – service intervals - Towing and recovering.

MODULE II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE 8

General Engine service- Dismantling of Engine components- Engine repair-working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls.

MODULE III TRANSMISSION AND DRIVELINE MAINTENANCE 8

Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

MODULE IV STEERING, SUSPENSION, BRAKE AND WHEEL MAINTENANCE 12

Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures. Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, and power steering system.

Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, parking brake. Bleeding of brakes. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation.

MODULE V AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE 9

Maintenance of batteries, starting system, charging system and body electrical - Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Panchal, Dhruv U., et al. Vehicle Maintenance and Garage Practice. India, PHI Learning, 2014.
2. Denton, Tom. Advanced Automotive Fault Diagnosis. N.p., Taylor & Francis, 2006.

REFERENCES:

1. Bonnick, Allan, and Newbold, Derek. A Practical Approach to Motor Vehicle Engineering and Maintenance. United States, CRC Press, 2011.
2. VanGelder, Kirk T. Automotive Engine Repair. United States, Jones & Bartlett Learning, 2017.

COURSE OUTCOMES: students can able to

CO1: Prepare maintenance schedules and procedures with appropriate tools.

CO2: Demonstrate the procedure and methods to repair and calibrate the engine.

CO3: Analyse the causes and remedies for fault in transmission and drive line systems.

CO4: Analyse the causes and remedies of steering, suspension systems, brake

and wheel.

CO5: Demonstrate the procedure for maintenance in wiring and air conditioning systems.

Board of Studies (BoS) :

14th BOS of AUTO held on
22.08.2022

Academic Council:

19th Academic Council held on
29.09. 2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	H	H	H							H		H	H	H
CO2	H	H	H							H		H	H	H
CO3	H	H	H							H		H	H	H
CO4	H	H	H							H		H	H	H
CO5	H	H	H							H		H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No. 9 : Sustainable development in the transport

Statement: Improve the durability and maintenance of vehicles.

GEDX 339	WASTEWATER MANAGEMENT	L	T	P	C
		3	0	0	3

SDG: 6**COURSE OBJECTIVES:**

The objectives of the course are

COB1: To impart knowledge on the generation , type and characteristics of domestic wastewater

COB2: To give an insight on the principle of domestic wastewater treatment

COB3: To familiarize the characteristics of industrial wastewater and its treatment methods

COB4: To provide exposure about the cycle of sanitation and stages of septage management

COB5: To impart knowledge on the advanced techniques in sewage treatment

MODULE I WASTEWATER GENERATION 9

Wastewater generation - Types of domestic wastewater - Types of sewerage system - Storm water management - Flow estimation - Sewage characteristics – Impact of untreated effluents on land and water - Pollution Control Rules and Environmental legislation.

MODULE II DOMESTIC WASTEWATER TREATMENT 9

Onsite and offsite challenges in wastewater treatment – Stages of wastewater treatment – Principles and Functions of treatment process - Working of Septic tanks - Onsite grey water treatment - wetland treatment - Capturing nutrients - Stages in Sludge management

MODULE III INDUSTRIAL WASTEWATER TREATMENT 9

Sources and characteristics of industrial wastewater - Effects of Industrial wastes on sewerage system - Sewage treatment plants and receiving water bodies - Standards related to industrial wastewater - Pre-treatment - Waste volume reduction, waste strength reduction, neutralization, equalization and proportioning, Removal of Organic and inorganic dissolved solids

MODULE IV SEPTAGE TREATMENT 9

Full cycle of sanitation - Sustainable practices in capture and containment - Septage treatment using Drying beds, Planted drying bed, Anaerobic digestion - Disposal and resource recovery - Challenges in operation and maintenance of receiving and treatment facilities

MODULE V ADVANCED TREATMENT METHODS AND REUSE 9

Advances in sewage treatment – Microalgae based wastewater treatment technologies – Advances in membrane technology - Thermal hydrolysis technology for sludge treatment – Biogas generation - Wastewater Reuse and Recycle - Regulations Standards - Types of Reuse – Agriculture - Groundwater Recharge.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Mackenzie L. Davis,. “Water and Wastewater Engineering: Design Principles and Practice”, Second Edition (McGraw-Hill Education: New York, 2020).
2. Metcalf and Eddy, “Wastewater Engineering Treatment, Disposal and Reuse”, Tata McGraw Hill, 2007.
3. Narayana Rao M and Amal K. Datta “Wastewater Treatment, Rational methods of Design and Industrial practices”, Oxford and IBH Publications, Third Edition, New Delhi, Reprint 2009
4. Strande, L., Ronteltap, M., and Brdjanovic, D., Fecal Sludge Management: Systems Approach for Implementation and Operation, IWA Publishing, 2014.

REFERENCES:

1. Athar Hussain, Sirajuddin Ahmed. “Advanced Treatment Techniques for Industrial Wastewater”, IGI Global, USA, 2018.
2. Arceivala, S.J., “Wastewater Treatment for Pollution Control & Reuse”, McGraw-Hill, New Delhi, 3rd Edition, 2006.
3. NG Wun Jern. “Industrial Wastewater Treatment”. World Scientific, Imperial College Press, Singapore, 2020.
4. Patwardhan, A. D, “Industrial Wastewater Treatment”, PHI Learning (P) Ltd., New Delhi, 2017.
5. Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu, Municipal Administration and Water Supply Department Government of Tamil Nadu, 2020.

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1:describe the types of wastewater, its generation and characteristics

CO2: explain the treatment of domestic wastewater.

CO3: identify and suggest the treatment methods relevant to the industrial wastewater

CO4: illustrate the current practices for septage management

CO5: describe the advanced treatment methods and recommend options for reuse

Board of Studies (BoS) :

18th BoS of CE held on 05.04.2023

Academic Council:

20^h Academic Council held on 23.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1			L			M	H					M			H
CO2			L			M	H					M			H
CO3			L			M	H					M			H
CO4			L			M	H					M			H
CO5			L			M	H					M			H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No.6 :Ensure availability and sustainable management of water and sanitation for all

The knowledge on the Domestic and industrial wastewater management along with the sanitation would cater the development of infrastructure aiming to reduce pollution and safeguard the environment.