



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 22<sup>nd</sup> Academic Council)*

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**B.Sc. (Computer Science)**



**REGULATIONS 2021**

**CURRICULUM AND SYLLABI**

**(Updated upto September 2024, as per 22<sup>nd</sup> Academic Council)**

**B.Sc. COMPUTER SCIENCE**



## **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 APPLICATIONS**

### **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**

The Department of Computer Applications, endeavours

- 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****B.Sc. (COMPUTER SCIENCE)****PROGRAMME EDUCATIONAL OBJECTIVES**

The Programme Educational Objectives of B.Sc. (Bachelor of Science in Computer Science) are listed below:

**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 of 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 processes.

**PO10:** Comprehend and write effective project reports.

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

**PO12:** Become 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 22<sup>nd</sup> 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.	<b>BCA</b>	i. Cloud Technology and Information Security ii. Mobile Applications and Information Security iii. Data Science iv. Multimedia and Web Application Development v. Artificial Intelligence vi. Cyber security vii. Datascience
2.	<b>B.Sc.</b>	i. Computer Science ii. Biotechnology
3.	<b>BBA</b>	i. General ii. Financial Services
4.	<b>B.Com</b>	i. General ii. Honours iii. Accounts and Finance
5.	<b>B.A.</b>	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:

<b>Assessments</b>	<b>Course Coverage in Weeks</b>	<b>Duration</b>	<b>Weightage of Marks</b>
<b>Assessment 1</b>	1 to 6	1.5 hours	25%
<b>Assessment 2</b>	7 to 12	1.5 hours	25%
<b>Semester End Examination</b>	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  $i^{\text{th}}$  course and  $GP_i$  is the Grade Point in the  $i^{\text{th}}$  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 X 10

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

<b>Classification</b>	<b>CGPA</b>
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 clause 7.1.1)

**15.6.3** The students who do not satisfy clause 16.6.1 and clause 16.6.2 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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**B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND  
TECHNOLOGY**

**CURRICULUM & SYLLABI, REGULATIONS 2021**

**B.Sc. COMPUTER SCIENCE  
(SIX SEMESTERS / FULL TIME)**

**SEMESTER I**

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	AEC	END 1183	General English – I	3	0	0	3
2.	AEC	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	Programming in C	3	0	0	3
6.	CC	CAD 1103	Data Structures	3	0	0	3
7.	LC	CAD 1104	Programming in C Laboratory	0	0	4	2
8.	LC	CAD 1105	Data Structures Laboratory	0	0	4	2
<b>Credits</b>							<b>23</b>

**SEMESTER II**

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	AEC	END 1283	General English – II	3	0	0	3
2.	AEC	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	Probability and Statistics	3	1	0	4
4.	CC	CAD 1201	OOPS with C++	3	0	0	3
5.	CC	CAD 1202	Operating Systems	3	0	0	3
6.	MC	GED 1207	Environmental Studies	2	0	0	2
7.	LC	CAD 1203	OOPS with C++ Laboratory	0	0	4	2
8.	LC	CAD 1204	Linux Laboratory	0	0	4	2
<b>Credits</b>							<b>22</b>



**SEMESTER III**

Sl. No.	Course Group	Course Code	Course Title	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 Systems	3	0	0	3
4.	CC	CAD 2104	Computer Networks	3	0	0	3
5.	CC	CAD 2105	Programming in Java	3	0	0	3
6.	CC	CAD 2108	Digital Marketing	3	0	0	3
7.	LC	CAD 2106	Relational Database Management Systems 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
<b>Credits</b>							<b>23</b>

**SEMESTER IV**

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	SEC	CAD 2201	Python Programming	3	0	0	3
2.	CC	CAD 2204	Web Design and Development	3	0	0	3
3.	CC	CAD 2205	Data Mining and Data Warehousing	3	0	0	3
4.	CC	CAD 2206	Object Oriented Analysis and Design	3	0	0	3
5.	EC		Programme Elective – I	3	0	0	3
6.	OEC		General / Open Elective	3	0	0	3
7.	LC	CAD 2203	Python Programming Laboratory	0	0	4	2
8.	LC	CAD 2207	Web Design Laboratory	0	0	4	2
9.	SEC	GED 2204	Aptitude and Workplace Skills	0	0	2	1
<b>Credits</b>							<b>23</b>

**SEMESTER V**

<b>Sl. No</b>	<b>Course Group</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	PCC	CAD 3101	Logical Reasoning and Thinking	3	0	0	3
2.	PCC	CAD 3102	Full Stack Development	3	0	0	3
3.	DSE	CAD 3103	Cyber Security	3	0	0	3
4.	DSE	CAD 3104	Cloud Services	3	0	0	3
5.	DSE	CAD 3105	Software Testing	3	0	0	3
6.	DSE		Programme Elective –II	3	0	0	3
7.	LC	CAD 3106	Full Stack Development Laboratory	0	0	4	2
8.	LC	CAD 3107	Cloud Services Laboratory	0	0	4	2
9.	SBC		Professional Development Activities	0	0	0	0
<b>Credits</b>				<b>22</b>			

**SEMESTER VI**

<b>Sl. No.</b>	<b>Course Group</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	PCC	CAD 3201	Enterprise Application Development	3	0	0	3
2.	LC	CAD 3202	Project	0	0	0	12
3.	DSE	CAD 3203	Data Visualization (Lab Integrated Theory )	3	0	2	4
<b>Credits</b>				<b>19</b>			

**Overall Total Credits – 132**

**PROGRAMME ELECTIVE COURSES FOR****B.Sc. COMPUTER SCIENCE - R 2021**

<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**PROGRAMME ELECTIVE – 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 Technology	3	0	0	3
7	CADX 256	Introduction to Data Analytics	3	0	0	3

**PROGRAMME ELECTIVE – 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	CADX 154	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 / GENERAL ELECTIVE COURSES FOR BA/ BBA / B.Com. / BCA / B.Sc  
PROGRAMMES R 2021**

<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Offering Department</b>
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

B.Sc.	Computer Science				Regulations 2021		
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
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**

<b>END 1183</b>	<b>GENERAL ENGLISH I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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

**MODULE III 9**

**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

**MODULE IV 9**

**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 Sundar Pichai. (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, 2<sup>nd</sup> 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=OFPwDe22CoY>
7. [https://www.youtube.com/watch?v=iAls\\_g\\_orac8](https://www.youtube.com/watch?v=iAls_g_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) :**

13<sup>th</sup> BoS of the Department of  
English held on 17.6.2021

**Academic Council:**

17<sup>th</sup> 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
<b>நோக்கங்கள்</b>					
<ul style="list-style-type: none"> <li>சமூக மாற்றச்சிந்தனைகளை உள்ளடக்கிய தற்காலஇலக்கியங்களை அறிமுகம் செய்தல்</li> <li>இருபதாம் நூற்றாண்டு மரபுக்கவிதைகளை அறிமுகம் செய்தல்</li> <li>புதுக்கவிதை, சிறுகதை, உரைநடை ஆகிய இலக்கியங்களை நயம் பாராட்டுதல்</li> <li>புதுக்கவிதை மற்றும் சிறுகதையின் தோற்றம் வளர்ச்சி குறித்து எடுத்துரைத்தல்</li> <li>சந்திப் பிழையின்றி எழுத மாணவர்களைப் பயிற்றுவித்தல்</li> <li>கவிதை மற்றும் சிறுகதை எழுதமாணவர்களை ஊக்கப்படுத்துதல்</li> </ul>					
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-அலிகள், ஆண்டாள் பிரியதர்சினி- தொலைந்து போனது, மு.மேத்தா-தேசப்பிதாவுக்கு ஒரு தெருப்பாடகனின் அஞ்சலி, ஹைக்கூ கவிதைகள்.					
அலகு III	சிறுகதைகள்				8
ஜெயகாந்தன்-நந்தவனத்தில் ஓர் ஆண்டி, கி.இராஜநாராயணன்- கதவு, சு.சமுத்திரம்- ஏழை-ஆப்பிள்-நட்சத்திரம், மாதவிக்குட்டி-நெய்ப்பாயாசம், தி.ஜனகிராமன்-முள்முடி.					
அலகு IV	மொழிப்பயிற்சி				7
கலைச்சொல்லாக்கம், பிழைத்திறுத்தம் (ஒருமை, ல-ள-டி-கர, 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					
<b>அறிப்புகள்</b>					
1. பொதுத் தமிழ்- செய்யுள் திரட்டு- தமிழ்த் துறை வெளியீடு					
2. தமிழ் இலக்கிய வரலாறு-சோம. இளவரசு					
3. சிறுகதைத் தொகுப்பு (கட்டுரைக் களஞ்சியம்)					
வெளிப்பாடு					
<ul style="list-style-type: none"> <li>மாணவர்கள் சமூக மாற்றச்சிந்தனைகளை அறிந்து கொள்வர்</li> <li>இருபதாம் நூற்றாண்டு மரபுக்கவிதைகள் குறித்த அறிவினைப்பெறுவர்.</li> <li>சந்திப்பிழைகளை நீக்கி எழுதும் திறன் பெறுவர்</li> <li>இருபதாம் நூற்றாண்டு தமிழ் இலக்கியத்தின் வரலாறு, வளர்ச்சி, பாடுபொருள் ஆகியவற்றை உணர்ந்து கொள்வர்.</li> <li>இருபதாம் நூற்றாண்டு தமிழ் இலக்கியப் படைப்பாளர்களைப் பற்றி அறிந்து கொள்வர்.</li> <li>புத்திலக்கியங்களைப் படைக்கும் திறனையும் திறனாய்வு செய்யும் திறனையும் பெறுவர்</li> </ul>					

**Board of Studies (BoS):**

15<sup>th</sup> BoS of the Department of  
Commerce held on 24.6.2021

**Academic Council:**

17<sup>th</sup> AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
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.

<b>LND 1182</b>	<b>GERMAN – I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

The objectives of this course are:

**COB1:** To improve the proficiency of students in German language.

**COB2:** To create awareness of using vocabulary among students.

**COB3:** To expose them to correct grammatical forms of the language.

**COB4:** To empower them for successful communication in the society.

**COB5:** To understand matters which are of daily usage

**COB6:** To understand them for describe the people need and their requirements.

**MODULE I                                    GUTEN TAG!                                    7**

Learn alphabet, introduction to German -greetings, identifying countries and their capital cities and languages, introducing oneself, read and write Cardinal numbers till 100, Read and write telephone numbers and e-mail addresses. Grammar - question words, sentence structure and formation, Regular verbs - Conjugation and personal pronouns.

**MODULE II                                    FREUNDE, KOLLEGEN UND ICH                                    7**

Introducing Others and Family Members, To speak about hobbies, jobs, learn Cardinal numbers from 101, Days, Months, Seasons, Colours, Day Timings, directions; Vocabulary: related to the topic; Grammar: Definite Articles, Irregular Verbs & Conjugations, Auxiliary verbs, ja/nein Fragen und Antworten, Nouns singular/plural.

**MODULE III                                    IN DER STADT                                    8**

To know places, buildings, know transport systems, understand international words, Shopping, talk to sales person while purchasing goods, return faulty goods at a shop, asking someone to repeat something, read and write Ordinal numbers till 100,; Vocabulary: related to the topic; Grammar: Indefinite articles, Negotiation, Imperative - Sie form.

**MODULE IV                                    GUTEN APPETIT!                                    8**

To speak about food, Daily routine, Going to the market – asking prices, filling up simple forms; Vocabulary: related to the topic; Grammar: Verb position, Simple Present Tense with regular and irregular verbs.

**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):****Academic Council:**14<sup>th</sup> BoS of the Department of 17<sup>th</sup> AC held on 15.07.2021

Commerce held on 22.04.2021

	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.

<b>LND 1183</b>	<b>ARABIC LANGUAGE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>MODULE I</b>	<b>INTRODUCTION TO ARABIC READING AND WRITING</b>	<b>9</b>
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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).

<b>MODULE II</b>	<b>LISTENING ARABIC COMMUNICATION</b>	<b>9</b>
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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).

<b>MODULE III</b>	<b>SIMPLE SENTENCES</b>	<b>9</b>
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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) (أسماء أواني) - cooking (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)

<b>MODULE IV</b>	<b>COMMUNICATION PRACTICE</b>	<b>9</b>
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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 – 45; Total Hours – 45**

#### **TEXT BOOKS:**

1. Al QirathulArabiyya Lil Muftadiyeen للقراءة 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 Ghairin Natiqeen Biha, Islamic Foundation Trust, Chennai, 2002.

#### **COURSE OUTCOMES:**

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

**CO1:** Vocabulary related to the market, doctor, parts of body, dining.

**CO2:** Identify Arabic names of animals, birds, singular and plural, interrogatory sentences.

**CO3:** Recognize Arabic alphabets, reading and writing and pronunciation.

**CO4:** Use countries names, singular, dual and plural.

**CO5:** Form Arabic sentences using verbs, tenses and numbers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	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.





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 Eigen vector 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) :**

12<sup>th</sup> BOS of Mathematics and AS  
held on 23.06.2021

**Academic Council:**

17<sup>th</sup> 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

<b>CAD 1101</b>	<b>COMPUTER FUNDAMENTALS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>AND ORGANIZATION</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Impart the knowledge on historical development of Computers, different number systems and logic gates.

**COB2:** Learn the basic structure of CPU, computer memory and Input - Output units.

**COB3:** Understand the concepts of Boolean algebra and Circuit reduction methods.

**COB4:** Describe the components of Sequential logic circuits.

**COB5:** 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” 6<sup>th</sup> 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” 2<sup>nd</sup> 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) :**

15<sup>th</sup> BoS of CA held on 22.06.2021

**Academic Council:**

17<sup>th</sup> 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 an advanced computer laboratory with innovative capacity to solve all kinds of hardware infrastructure and installation related issues and provide hardware infrastructure support services.

<b>CAD 1102</b>	<b>PROGRAMMING IN C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 15<sup>th</sup> Edition, PBP Publications, 2010.

**REFERENCES:**

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

**COURSE OUTCOMES:**

**CO1:** Identify the characteristics of programming

**CO2:** Describe the fundamentals of C programming

**CO3:** Apply the advance concepts of C programming

**CO4:** Identify the role of Pointers in C language

**CO5 :** Explain the importance of file handling

**Board of Studies (BoS) :**

**Academic Council:**

15<sup>th</sup> BoS of CA held on 22.06.2021

17<sup>th</sup> 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	PO1 1	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.

<b>CAD 1103</b>	<b>DATA STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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. Reema Thareja, "Data Structures using C", Second Edition, Oxford University Press, 2011.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2<sup>nd</sup> Edition, Pearson Education, 2014.

**REFERENCES:**

1. A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, "Data Structures Using C" Pearson Education India, 2<sup>nd</sup> Edition, 2015.
2. Ellis Horowitz, Sartaj Sahni, "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", 2<sup>nd</sup> 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) :**

15<sup>th</sup> BoS of CA held on 22.06.2021

**Academic Council:**

17<sup>th</sup> 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.

<b>CAD 1104</b>	<b>PROGRAMMING IN C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### 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.

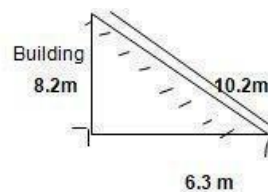
**COB4:** Disseminate the techniques and methods to handle the dynamics memory using pointers.

**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  $n^{\text{th}}$  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 and 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. Reema Thareja, Computer Fundamentals and Programming in C, Oxford Press, 2012.

**REFERENCES:**

1. Programming in C, Pradip Dey, Manas Ghosh, 2<sup>nd</sup> edition Oxford University Press, 2013.
2. Programming in ANSIC, E.Balaguruswamy, 5<sup>th</sup> Edition, 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) :**

15<sup>th</sup> BoS of CA held on 22.06.2021

**Academic Council:**

17<sup>th</sup> 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.



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<b>CAD 1105</b>	<b>DATA STRUCTURES LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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. Narasimha Karumanchi, "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) :**

15<sup>th</sup> BoS of CA held on 22.06.2021

**Academic Council:**

17<sup>th</sup> AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
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**

<b>END 1283</b>	<b>GENERAL ENGLISH - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 (learn English)**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, 2<sup>nd</sup> Edition, 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 analyse 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):**

**Academic Council:**

13<sup>th</sup> BoS held in the Department of English On 17.6.2021  
17<sup>th</sup> 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	PO 13
CO1													M
CO2													M
CO3						M	H						
CO4						L	M						
CO5						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:** This course helps the students to read, comprehend and appreciate the value of literature to life. It also helps them to enrich LSRW skills in academic and professional contexts.

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
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.



<b>LND 1282</b>	<b>GERMAN – II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** To enable the learners to listen and understand the spoken German language which uses the elementary spoken structures.

**COB2:** To enable the learners to speak and engage in simple dialogues in German.

**COB3:** To enable the learners to read and understand the elementary texts in German.

**COB4:** To enable the learners to write simple sentences and short paragraphs in German.

**COB5:** To demonstrate Proficiency in reading, writing, and speaking in basic German. Learning vocabulary related to profession, education, day-to-day activities, food, culture, sports and hobby, family set up, workplace, market and classroom activities are essential.

**COB6:** To make the students industry oriented and make them adapt in the German culture.

<b>MODULE I</b>	<b>KONTAKTE</b>	<b>7</b>
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To arrange appointments, understand and give instructions, understand and reply letters, find information in the text, identify the situations and understand the conversation; Vocabulary: related to the topic; Grammar: Dative personal pronomen, Possessive Pronomen, verbs and Preposition.

<b>MODULE II</b>	<b>MEINE WOHNUNG</b>	<b>7</b>
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To understand the advertisements related to flats/houses, describe a flat, write a text about a flat; Vocabulary: related to the topic; Grammar: Adjective with sein (sehr/zu), wechselfreposition with Dative.

<b>MODULE III</b>	<b>ALLES ARBEIT?</b>	<b>7</b>
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To describe daily routine, talk about the past, speak about jobs, position, advertisements, prepare telephone conversation; Vocabulary: related to the topic; Grammar: Imperativ -Du form, Simple Past tense (regular & irregular verbs).

**MODULE IV KLEIDUNG UND MODE 8**

KLEIDUNG UND MODE – LEARNING: To speak about clothes, understand the conversation at shopping centers, shopping for dresses, lead a discussion on purchasing dresses and orient oneself about a shopping complex. Vocabulary: related to the topic; Grammar: Trennbare & Untrennbare Verben, Introduction to reflexive pronoun und Reflexive verbs.

**MODULE V GESUND UND MUNTER 8**

To make personal statements, name body parts, understand sport activities, conversation with the doctor, get & give tips to healthy life, The prefix Lieblings -Sentence formation; Advanced Conversation skills (pertaining chiefly to simple dialogues in everyday situations), Vocabulary: related to the topic; Grammar: Simple Future Tense, Es gibt, Gibt es? -sentence formation.

**MODULE VI AB IN DEN URLAUB! 8**

To suggest a city tour, describe the directions, write a Simple Email and reply, describe the weather, make a complaint in the hotel, speak about the trips; Advanced Text - Reading Comprehension And Translation Practice from German Into English Vice versa; Vocabulary: related to the topic and related to School, University, Professions; Grammar: Adverbs (time), Join sentences with “und”, “oder”, and “aber”.

**L -45; Total Hours – 45**

**TEXT BOOKS:**

1. Stefanie Dengler, “Netzwerk A1.2”, 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:** remember greeting people, introducing oneself and understanding basic expressions in German

**CO2:** read and describe basic German sentences relating to routine situations.

**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):

14<sup>th</sup> BoS of the Department of Commerce  
held on 22.04.2021

### Academic Council:

17<sup>th</sup> 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.

<b>LND 1283</b>	<b>MODERN COMMUNICATIVE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG 4</b>	<b>ARABIC</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 (الجو) – 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 (إلى - في - مع) (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 (الحج والتأكييد 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 ( 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.

<b>MAD 1288</b>	<b>PROBABILITY AND</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>	<b>STATISTICS</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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, New Delhi 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. Lopushaä C., Dekking, F.M., Kraaikamp, H.P., Meester, L.E. "A Modern Introduction to Probability and Statistics", 2<sup>nd</sup> 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) :**

12<sup>th</sup> BOS of Mathematics & AS held on  
23.06.2021

**Academic Council:**

17<sup>th</sup> 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

<b>CAD 1201</b>	<b>OOPS WITH C++</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 with C++, Tata McGraw Hill. Publications ,6<sup>th</sup> edition 2013

**REFERENCES:**

1. Bjarne Stroustrup, "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) :**

15<sup>th</sup> BoS of CA held on 22.06.2021

**Academic Council:**

17<sup>th</sup> 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											H	
CO2							H						H	
CO3			H				H						H	
CO4			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:** 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.

<b>CAD 1202</b>	<b>OPERATING SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Introduce the fundamental concepts of Operating Systems.

**COB2:** Learn the concept of CPU Scheduling and Deadlocks.

**COB3:** Explore the Memory Management concepts.

**COB4:** Understand directory structure, file allocation methods and disc scheduling concepts

**COB5:** Train on LINUX commands and basic file management operations.

**MODULE I INTRODUCTION TO OPERATING SYSTEMS AND THREADS 9**

Objectives and Functions of OS - Operating System Components and Services, Types of Operating systems - System calls, Process Concepts -Process Scheduling – Co-operating process-Introduction to Threads.

**MODULE II PROCESS MANAGEMENT AND DEADLOCK 9**

CPU Scheduling : Scheduling criteria and Introduction to scheduling algorithms —First Come First Serve (FCFS) - Shortest Job First(SJF) – Round Robin Scheduling - Process Synchronization: Mutual Exclusion, Critical – section problem, Semaphores, Critical Regions- Deadlock : Deadlock prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock .

**MODULE III MEMORY MANAGEMENT 9**

Basics concepts of swapping, Contiguous Memory Allocation, Paging: Segmentation with paging-Virtual Memory Management : Demand paging-Process, Creation-Introduction to Page Replacement Algorithm – First In First Out(FIFO) – Optimal Page Replacement(ORP) - Least Recently Used(LRU) - Thrashing.

**MODULE IV FILE SYSTEM AND DISK SCHEDULING 9**

File concepts and Access Methods - File Structure and Allocation Method - Disk Management and Disk Structure-Introduction to Disk Scheduling –

First Come First Served (FCF) – Shortest Seek Time First (SSTF) – SCAN – CSCAN – LOOK- CLOOK –Introduction to Security and Threats.

## **MODULE V                      LINUX – OPEN SOURCE OPERATING SYSTEM                      9**

What Is Linux? -The Problems with Windows -The Benefits of Linux - Proprietary Software and the GPL- GNU and Linux Together- Different Flavors of Linux- Who 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, 4<sup>th</sup> edition,Pearson Education,2012
2. Operating System by H.M. Deitel, 2<sup>nd</sup> Edition, Pearson Education, 2002.
3. Operating Systems by Nutt, 3/e Pearson Education 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) :**15<sup>th</sup> BoS of CA Meeting held on 22.06.2021**Academic Council:**17<sup>th</sup> 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	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.

<b>GED 1207</b>	<b>ENVIRONMENTAL STUDIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: All</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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.

<b>MODULE I</b>	<b>MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES</b>	<b>8</b>
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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.

<b>MODULE II</b>	<b>ECOSYSTEMS AND BIODIVERSITY</b>	<b>8</b>
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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; Biogeographical 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, Text Book for Environmental Studies - Environmental Studies for Undergraduate Courses, University Grants Commission, New Delhi and BharatiVidyapeeth Institute of Environmental Education and Research, Pune, 2004.
2. *Ravikrishnan A.*, Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Pvt.Ltd. Chennai, 2017.

**REFERENCES:**

1. Clair N. Sawyer, Perry L. McCarthy and Gene F. Parkin, Chemistry for Environmental Engineering and Science, 5th Edition, Tata McGraw-Hill Education Pvt. Ltd, India, 2011.
2. J. Glynn Henry and Gary W. Heinke, Environmental Science and Engineering, 2nd Edition, Prentice Hall of India, 2004.
3. J. Jeffrey Peirce, P. Aarne Vesilind, Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann, 1997.
4. Trivedi, R.K., Handbook of Environmental Law's, Rules, Guidelines, Compliances and Standards, Volume 1 and 1, Envio Media.
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 on the impact of human population and the health related issues and immunisation practices and sustainable developments for a healthy life

**Board of Studies (BoS) :**

11<sup>th</sup> BoS of Chemistry held on  
17.06.2021

**Academic Council:**

17<sup>th</sup> 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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.

<b>CAD 1203</b>	<b>OOPS WITH C++ LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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 with C++, Tata McGraw Hill Publications, 2015.

**REFERENCES:**

1. Stroustrup: The C++ Programming Language, Pearson Edition, 3<sup>rd</sup> Edition 2010.
2. Herbert Schildt, "C++:The Complete Reference", Tata McGraw Hill fourth Edition, 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) :**

15<sup>th</sup> BoS of CA held on 22.06.2021

**Academic Council:**

17<sup>th</sup> 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											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.

<b>CAD 1204</b>	<b>LINUX LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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 Channelle and Jaime Sicam, 4<sup>th</sup> 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) :**15<sup>th</sup> BoS of CA held on 22.06.2021**Academic Council:**17<sup>th</sup> 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	
CO4				L	M						M		L	M
CO5		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.

**SEMESTER III**

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

**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) :**16<sup>th</sup>BoS of CA held on 23.12.2021**Academic Council:**18<sup>th</sup> 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						H	
CO2			M		L									M
CO3					M						L		H	
CO4		L	M		H								M	
CO5			H		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:** The learner will be able to analyze and design algorithms with appropriate methods and techniques.

<b>CAD 2102</b>	<b>SOFTWARE ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 RAD Model– 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 SOFTWARE MAINTENANCE AND PROJECT MANAGEMENT 9**

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**

### **TEXT BOOKS:**

1. Ian Sommerville, "Software Engineering"- 10<sup>th</sup> 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. 1.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.

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA held on **23.12.2021**

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	P O1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO1 1	PO 12	PSO 1	PSO2
CO1				M			L							H
CO2		H	L	M									H	
CO3							M				H			H
CO4				L			H							M
CO5							M	H			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:** Software Engineering help the leaners to inculcate the tools for making business decisions and to implement real time projects. Software testing helpsthe 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 increase their competitive intelligence.

<b>CAD 2103</b>	<b>RELATIONAL DATABASE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>MANAGEMENT SYSTEMS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 9  
CONCURRENCY 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. Ramez Elmasri, 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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	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	H	H											H		
CO2		H			H										
CO3		H			H				H				H		
CO4			H						H				H		
CO5			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.

**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.

<b>CAD 2104</b>	<b>COMPUTER NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 5<sup>th</sup> 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):**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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					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.

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

<b>CAD 2105</b>	<b>PROGRAMMING IN JAVA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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” 6<sup>th</sup> edition, McGraw-Hill Education, 2019.
- 2.Hortsmann& Cornell, "Core Java Advance Features VOL II", 9<sup>th</sup>Edition, PearsonEducation,2015.

**REFERENCES:**

- 1.Patrick Naughton, "Complete Reference: JAVA 2", 8<sup>th</sup> Edition, Tata Mc Graw Hill, July 2017.
- 2.Andrew Lee Rubinger, Bill Burke "Enterprise JavaBeans 3.1", 6<sup>th</sup>Edition, 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) :**

16<sup>th</sup>BoS of CA held on  
**23.12.2021**

**Academic Council:**

18<sup>th</sup> 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	PSO3
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** : :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



<b>CAD 2108</b>	<b>DIGITAL MARKETING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG : 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES :**

**COB1:** Understand the major concepts of Digital marketing and its various tools.

**COB2:** Understand the major digital marketing channels- online advertising, digital display, video, mobile, search engine and social media.

**COB3:** Learn and develop, evaluate and execute comprehensive digital marketing strategies and plan.

**COB4:** Learn how to measure digital marketing efforts and calculate CPC and ROI.

**COB5:** Explore the latest digital ad technologies.

**MODULE I INTRODUCTION TO DIGITAL MARKETING 09**

Digital Marketing , History of SEO , Comparison between digital and traditional marketing , importance of digital marketing , Benefits of digital marketing , various digital marketing tools, Digital marketing strategies and goals , case study- latest trends in digital marketing.

**MODULE II SEARCH ENGINE OPTIMIZATION 09**

Introduction to SEO, components of SEO, SEO keyword planning, ON Page SEO, OFF Page SEO, Local SEO, Mobile SEO, Ecommerce SEO, Measuring SEO effectiveness.

**MODULE III SOCIAL MEDIA MARKETING 09**

Introduction to social media marketing, benefits of using SMM, Social Media Strategy and statistics, blogging , social networking , face book marketing , Instagram marketing, twitter marketing, LinkedIn marketing, Google plus marketing, SMM analytical tools.

**MODULE IV SEARCH ENGINE MARKETING 09**

Introduction to search engine marketing, various SEM tools, email marketing ,PPC,CPC bidding, report generation, case study –create a campaign using Google Ads.

**MODULE V APPLICATION OF DIGITAL MARKETING 09**

Google Analytics, display advertisement technique, online reputation management, affiliate marketing, social media analytics, Ad designing , Video creation , case study –web page analysis.

**L – 45; Total Hours - 45**

**TEXT BOOKS:**

1. Ryan deiss and russ Hennesberry-“Digital Marketing for Dummies”2017
2. Danny star “ Digital marketing 2020 –grow business with digital marketing”

**REFERENCES :**

1. Jan Zimmerman, Deborah Ng “Social Media Marketing All-in-one Dummies -4th Edition / John Wiley & Sons Inc,”
2. Eric Enge, Stephan Spencer, Jessie Stricchiola “The Art of SEO “3rd Edition- O’Reilly Media Inc,

**COURSE OUTCOMES :**

Students who complete this course will be able to,

**CO1:** Define and explain various technologies associated with digital marketing.

**CO2:** Apply the knowledge of digital marketing concepts.

**CO3:** Construct an appropriate marketing model.

**CO4:** Analyze role and importance of digital marketing in a rapidly changing business landscape.

**CO5:** Implement the key elements of a digital marketing strategy.

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA held on **23.12.2021**

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

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

**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 understanding of concepts related to Digital Marketing and its various tools.

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

### **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, 3<sup>rd</sup> Edition, 2020.
2. Steven Feuerstein, Bill Pribyl & Chip Dawes, “Oracle PL/SQL Language Pocket Reference”, O’Reilly, 5<sup>th</sup> 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](https://docs.oracle.com/cd/E11882_01/server.112/e41085.pdf)

**REFERENCES:**

1. S. Sumathi, S. Esakki rajan, "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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> 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	PSO 1	PSO 2
CO1	H	M	M										H	M
CO2	L	L	M										H	M
CO3	M	L	M										H	M
CO4	M	L	M										H	M
CO5	M	L	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.

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

**COURSE OBJECTIVES:**

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

**COB2:** Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms

**COB3:** Work with collection API and develop fast programs.

**COB4:** Develop good multithreaded programs.

**COB5:** Develop user interface and painting graphics and images.

**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 primitive data types and arrays.

**CO4:** Write programs using interfaces, inheritance, and polymorphism.

**CO5:** Develop programs using Applet.

**Board of Studies (BoS) :**

**Academic Council:**

16<sup>th</sup>BoS of CA held on 23.12.2021

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	M		H											
CO2		M	M											
CO3							M							
CO4	M		M							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.



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

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

**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, Dhanpat Rai & 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) :**

13<sup>th</sup>BoS of Department of English  
held on 17.6.2021

#### **Academic Council:**

17<sup>th</sup> 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**

<b>CAD 2201</b>	<b>PYTHON PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 NUMPY, 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.

**L – 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, 5<sup>th</sup> Edition, 2013.
2. Tony Gaddis, Starting Out with Python, Pearson, 3<sup>rd</sup> Edition, ISBN-13:978-0133862256, 2011.
3. Downey, Allen B, Think Python: How to Think Like a Computer Scientist, O'Reilly, 2<sup>nd</sup> Edition, 2016.
4. David M. Baezly, Python Cookbook, O'Reilly Media, 3<sup>rd</sup> 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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

B.Sc.	Computer Science										Regulations 2021			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			M										H	
CO2							M						M	
CO3					M								M	
CO4			H						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.

<b>CAD 2204</b>	<b>WEB DESIGN AND</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>DEVELOPMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** To introduce the concepts and technologies used in website design.

**COB2:** Learn the use of Hypertext markup tags for web site design

**COB3:** Identify appropriate style properties to design web pages with style sheets

**COB4:** Develop basic programming skills using Javascript

**COB5:** Understand the principles of creating an effective dynamic web page using a framework.

**MODULE I INTRODUCTION 9**

Introduction to WWW - Introduction to Network, Internet and Intranet, Application and Services, Internet Addressing – URL, Elements of Web – Web Page, Designing Principles-Web Site Building, Web Languages – HTML/DHTML, JavaScript, PHP.

**MODULE II HYPER TEXT MARKUP LANGUAGE 9**

Building Web Based Application using Visual Studio- HTML-Html Document Structure, Various HTML Tags –Image Tag, Table Tag, Line Breaks, Frames, and Forms. HTML5 Tags –HTML5 New Elements- Event Attributes – HTML5: Google maps, GEO Location - HTML Canvas Tag - Audio, Video

**MODULE III CASCADING STYLE SHEET 9**

Introduction to Style sheet - Types of Style sheet, concept of class & ID – CSS Property– Background Property - Font property- Text property- Borders -Margins- Padding.

**MODULE IV CLIENT-SIDE SCRIPTING LANGUAGE 9**

Types of Scripting language, Introduction to JavaScript- JavaScript Operators- Conditional Structure & Looping Structure-Dialog Boxes- Arrays- Built-in Functions (String, Math, Date, Array)- Document Object Model-Form Objects and events-Form validation using JavaScript.

**MODULE V SERVER-SIDE SCRIPTING LANGUAGE 9**

Introduction to PHP-Basic PHP syntax-PHP tags, PHP statements-Variables-Global-Local-Static- Operators- Conditional and Looping Structure-Arrays-Indexed-Associative-Multidimensional- PHP MyAdmin- Performing basic database operations. Domain and Hosting, Introduction to Cpanel - Installing the wordpress – Installing themes and plugins – Deploy - Yoast SEO.

**L – 45; Total Hours – 45**

**TEXT BOOKS:**

1. HTML&CSS: The Complete Reference ,Fifth edition,Thomas A. Powell ,2010(I,II&III)
2. Beginning JavaScript 2nd Edition, Wrox, Nicholas C. Zakas,2007(IV)
3. PHP Bible, Wiley Publication, Tim Converse, Joyce Park,2002(V)

**REFERENCES:**

1. Developing Web Application, Wiley India Publication, Ralph Moseley,Wiley India,2007.
2. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,Ivan Bayross, 4th Edition ,2010.
3. Mastering Html, Css & Java script Web Publishing ,by Laura Lemay (Author), Rafe Colburn (Author), Jennifer Kyrnin (Author)BPB Publications First Edition– 15 July 2016.
4. [https://www.tutorialspoint.com/cpanel/cpanel\\_tutorial.pdf](https://www.tutorialspoint.com/cpanel/cpanel_tutorial.pdf)

**COURSE OUTCOMES:**

**CO1:** Demonstrate the knowledge and ability to apply the design principles and techniques in creating websites.

**CO2:** Identify HTML tags to construct the basic webpage

**CO3:** Incorporate CSS properties to provide effective presentation of information in web pages

**CO4:** Develop interactive dialog box using Javascript

**CO5:** Build dynamic web pages using word press framework

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO7	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	
CO4			H		H	M	M					M	H	
CO5			H		H	M	M					M	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.

Web designing Principles and 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 improve skill set to demonstrate competence in the practical art of providing quality content in websites and social media.

<b>CAD 2205</b>	<b>DATA MINING AND DATA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>WAREHOUSING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** To provide an overview of basic principles, concepts of data mining and architecture of data ware housing .

**COB2:** To introduce the different data preprocessing techniques.

**COB3:** To disseminate knowledge on mining patterns.

**COB4:** To provide insight to various of data mining techniques

**COB5:** To understand the concepts of classification and clustering

**MODULE I INTRODUCTION ON DATA MINING 9**

Introduction on Data mining, Data mining on various kinds of data– Relational databases – Data Warehouses - Transactional Databases – Advanced Data and Information Systems and Advanced Applications. Data mining Functionalities: Concept / Class Description, Characterization - Classification and Prediction – Cluster Analysis.

**MODULE II DATA WAREHOUSES AND OLAP 9**

Data Warehouse- Differences between Operational Database Systems and Data Warehouses- A Multidimensional Data Model- From Tables and Spreadsheets to Data Cubes- Data Warehouse Architecture- Steps for the Design and Construction of Data Warehouses, A Three-Tier Data Warehouse Architecture, Types of OLAP Servers: ROLAP versus MOLAP versus HOLAP.

**MODULE III DATA PREPROCESSING 9**

Descriptive Data Summarization– Data Cleaning - Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation-Attribute-Oriented Induction for Data Characterization - Presentation of the Derived Generalization Mining Class Comparisons: Discriminating between Different Classes.

**MODULE IV MINING – FREQUENT PATTERNS, ASSOCIATIONS CORRELATIONS 9**

Market Basket Analysis: A Motivating Example Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Pattern Mining: A Road Map, The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation,

Generating Association Rules from Frequent Itemsets, From Association Mining to Correlation Analysis Strong Rules.

**MODULE V CLASSIFICATION & CLUSTERS ANALYSIS 9**

Classification – Issues regarding Classification - Classification by Decision Tree Induction – Bayesian Classification – Rule Based Classification - KNN Classifiers.

Clusters Analysis: Types of Data In Cluster Analysis- Categorization of Major Clustering Methods: Partitioning Methods: k-Means, k-Medoids – Hierarchical Methods: BIRCH, Chameleon – Density based Methods: DBSCAN, OPTICS. Applications.

**L – 45; Total Hours – 45**

**TEXT BOOKS:**

1. Data Mining: The Data Mining Guide for Beginners, Including Applications for Business, Data Mining Techniques, Concepts, and More by Herbert Jones 2020.

**REFERENCES:**

1. Jiawei Han and Micheline Kamber : “Data Mining Concepts and Techniques”, 3rd Edition, Elsevier, 2012.
2. Joshi, Siva kumar & Yesha, Data Mining Next Generation Challenges and Future Directions, Prentice Hall of India, 2007
3. G.K. Gupta, PHI Private limited, Introduction to Data mining with case studies, New Delhi, 2008. 2nd Edition, PHI, 2011.

**COURSE OUTCOMES:**

On completion of this course students will be able to:

**CO1:** Understand the need of Data mining and their functionalities.

**CO2:** Select the appropriate preprocess technique to cleanse the data.

**CO3:** To analyze the data and mine patterns from the given data set.

**CO4:** Select the suitable classification / clustering algorithm and implement the same given dataset

**CO5:** Design exclusive data warehouse for a given business vertical.

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

Data mining is a process used by companies to turn raw data into useful information. Using software tools to look for patterns in large batches of data, businesses can learn more about their customers to develop more effective marketing strategies, increase sales and decrease costs. Data warehousing improves the speed and efficiency of accessing different data sets and makes it easier for corporate decision-makers to derive insights

<b>CAD 2206</b>	<b>OBJECT ORIENTED ANALYSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>AND DESIGN</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Understand the necessity of object orientation and development methodologies.

**COB2:** Write scenarios for the business use cases.

**COB3:** Design data model and system flow using UML diagrams.

**COB4:** Design the interface and input screens

**COB5:** Construct classes from the activity diagram and write test cases

**MODULE I INTRODUCTION 9**

An overview – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle.

**MODULE II METHODOLOGY AND UML 9**

Introduction – Survey – Rumbugh, Booch, Jacobson methods – Patterns – Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Use case diagrams – Dynamic modeling – Model organization –Extensibility.

**MODULE III OBJECT ORIENTED ANALYSIS 9**

Identifying Use case – Business object analysis – Use case driven object oriented analysis – Use case model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility. Case Study Analyzing ViaNet Bank ATM – The use case driven process.

**MODULE IV OBJECT ORIENTED DESIGN 9**

Design process – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface – Case study : Designing user interface

for Bank ATM system.

## MODULE V SOFTWARE QUALITY 9

Quality assurance – Testing strategies – Object orientation testing – Test cases– Test Plan –Debugging principles – Usability – Satisfaction –Usability testing– Satisfaction testing – Case Study : Developing Test plans and Test cases for the Bank ATM system.

**L – 45 ; Total Hours – 45**

### TEXT BOOKS:

1. Ali Bahrami, “Object Oriented System Development”, McGraw Hill International Edition, Reprint 2009.

### REFERENCES:

1. Craig Larman, Applying UML and Patterns, 2ndEdition, Pearson, 2002.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley Long man,1999.
3. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Patterns and Java, Pearson2004.

### COURSE OUTCOMES:

**CO1:** Describe basics of object orientation and development methodologies.

**CO2:** Identify the stakeholders as actors and develop sequence diagrams.

**CO3:** Construct classes from the activity diagram.

**CO4:** Design data base model and provide data base connectivity.

**CO5:** Write test cases and perform software testing.

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA 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	PSO1	PSO 2
CO1			H		H	M	M					M	H	
CO2		H	H		H	M	M					M	H	M
CO3			H		H	M	M					M	H	
CO4			H		H	M	M					M	H	
CO5			H		H	M	M	M	H	M	M	M	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.

Object oriented Analysis and Design Concepts taught in this course for the learners with respect to the course outcomes are measurable measurable and useful in applying one's disciplinary knowledge and transferable skills to new/unfamiliar contexts. The Learner's can able analyze and model Software specifications.

<b>CAD 2203</b>	<b>PYTHON PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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, McGraw 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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
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.

<b>CAD 2207</b>	<b>WEB DESIGN LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### **COURSE OBJECTIVES:**

**COB1:** To 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 its use for dynamic effects.

**COB4:** To develop an ability to design and implement static and dynamic website.

**COB5:** To understand how to effectively implement it in the web environment.

### **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, hyperlinks and book marks.
4. Develop a web page to display table and frames.
5. Create a web page to embed an image map in a web page.
6. Image tags & embedding a multimedia on to a web page (video, audio, zip).
7. Create a web page with all types of Cascading style sheets.
8. Design a web page using different CSS properties like border, background, text, and font.
9. Implement the following web applications using
  - (a) PHP
  - (b) Servlets
  - (c) JSP
    - i) Write a PHP Program to display current Date, Time and Day.
    - ii) A web application that takes name and age from an

HTML page. (If the age is less than 18, it should display a page with a message like “Hello, you are not authorized to visit the site” message. Else, it will display “Welcome to this site”.)

10. Implement the web applications with Database using (a) PHP, (b) Servlets and (c) JSP.
11. Create client Side Scripts for Validating Web Form Controls.
12. Develop a simple calculator using JavaScript.
13. Designing a digital clock using JavaScript.
14. Demonstrate string and math objects predefined methods available in JavaScript.
15. To create a html registration form and perform validation.

**P – 60; Total Hours - 60**

**TEXT BOOKS:**

1. Web Designing and Publishing Paperback – 25 June 2020 by Prof. Satish Jain (Author), M. Geetha Iyer.
2. Mastering Html, Css&Javascript Web Publishing by Laura Lemay, Rafe Colburn, et al. | 15 July 2016.
3. Developing Web Application, Wiley India Publication, Ralph Moseley, Wiley India, 2007.
4. 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(I,II&III).
2. Beginning JavaScript 2nd Edition, Wrox, Nicholas C. Zakas, 2004(IV).
3. PHP Bible, Wiley Publication, Tim Converse, Joyce Park, 2002(V).

**COURSE OUTCOMES:**

On completion of the course, Students will be able to

**CO1:** Demonstrate an understanding of basic HTML, CSS structures and JavaScript.

**CO2:** Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.

**CO3:** Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services.

**CO4:** Design the web environment in a professional way.

**CO5:** Design a graphics design ineffective manner.

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1													M	
CO2											M			
CO3		L	H	H					L				H	H
CO4			M	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 the components of web design packages and methods leads to constructing a user-friendly interfaces platform.

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

**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. Indu Sijwali, 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):**

13<sup>th</sup> BoS of Department of English held on 17.6.2021

#### **Academic Council:**

17<sup>th</sup> 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.





- 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.

**L- 45; 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 EducationIndia,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.

### **Board of Studies (BoS):**

19<sup>th</sup> BoS of CA held on 13.2.2023

### **Academic Council:**

20<sup>th</sup> 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
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		

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

**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.

<b>CAD 3102</b>	<b>FULL STACK DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Learn the concept of full stack web applications.

**COB2:** Identify the need of HTML, CSS, Javascript, ReactJS and AngularJS in client side applications.

**COB3:** Establish connection of Node.JS, Express with MongoDB in server side scripting.

**COB4:** Evaluate front -end and back-end used in full stack applications.

**COB5:** Create a real-world web and mobile applications.

**MODULE I INTRODUCTION 9**

Introduction – Advantages and disadvantages – Popular stacks – Languages, Frameworks and Libraries: Frond-end and Back-end – Text editors – HTML: Basic Tags – Forms – Images – Audio and Video – CSS: Selectors – Box Model – JavaScript: JavaScript Primer – Objects – Events – DOM – JSON – AJAX – jQuery.

**MODULE II FROND-END : ANGULAR JS 9**

Introduction – Features – MVC – Components – Expressions - Data Binding -Built-in directives – Custom directives – Controllers – Model – Services – Modules – Filters – Form Validation – Dependency injection – Routing.

**MODULE III FROND-END: REACT JS 9**

Introduction – Advantages and Disadvantages – React JSX – Creating React Application – Components – State and Props – Life cycle of Components – Rendering components – Lists – Forms – Events – React Hooks.– React Router – React Redux.

**MODULE IV BACK-END: NODE .JS AND EXPRESS 9**

Node.JS: Introduction – Environment Setup – Using the Terminals – NPM – Modules – Events – Callbacks – Handling Data I/O: Buffer, Stream – File system – Building a Web server – Express: Introduction – Configuring Express Settings – Configure Routes – Using Request and Response Object – Implementing Express Middleware – Implementing Express in Node.js

**MODULE V DATABASE AND WEB DEPLOYMENT 9**

Mongo DB: Introduction – Collections – Documents – Data Types - Administering Databases – Managing Collections – Adding the MongoDB Driver to Node.js - Connecting to MongoDB from Node.js – Accessing and Manipulating Databases – Accessing and Manipulating Collections – Manipulating MongoDB Documents from Node.js – Accessing MongoDB from Node.js - Using Mongoose for Structured Schema and Validation. Deployment: Tools – Deploying Node.js Apps: Heroku, AWS - MongoDB on Heroku.

**L – 45; TOTAL HOURS –45**

#### **TEXT BOOKS:**

1. Vasan Subramanian, “Pro MERN Stack Full Stack Web App Development with Mongo, Express, React, and Node”, Second Edition, Apress, 2019.
2. 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.
3. Adam Bretz and Colin J. Ihrig “Full Stack JavaScript Development with MEAN” SitePoint Pty. Ltd, 2014.

#### **REFERENCES**

1. Azat Mardan, “React Quickly: Painless web apps with React, JSX, Redux, and GraphQL” Manning Publications, 2017
2. Amos Q. Haviv, “MEAN Web Development”, Second Edition, Packt Publishing, 2016.
3. Shama Hoque, “Full-Stack React Projects Full-Stack React Projects”, Second Edition, Packt Publishing, 2020.

#### **COURSE OUTCOMES:**

**CO1:** Write client side scripting by using HTML5, CSS, JavaScript.

**CO2:** Design interactive and responsive user interface using ReactJS and AngularJS.

**CO3:** Build a webserver using NodeJS and Express.

**CO4:** Use Node.JS with MongoDB to access and manipulate databases

**CO5:** implement and deploy web applications.

**Board of Studies (BoS):**19<sup>th</sup> BoS of CA held on 13.2.2023**Academic Council:**20<sup>th</sup> Academic council held on  
13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	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 web technologies. This course will motivate the student to develop real time interactive web and mobile applications independently.

<b>CAD 3103</b>	<b>CYBER SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 web protection.

**COB4:** To know about the significance of tools used for web and system 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 SECURING SYSTEMS AND DEVICES 9**

Hacking windows - Unauthenticated and Authenticated Attacks-Windows security features- Bypassing windows password- Wireless scanning and Enumeration-Identifying wireless network defenses and counter measures-Gaining access to WPA- WEP

**MODULE III WEB PROTECTION 9**

HTTP Protocol : HTTP Requests, HTTP Responses and HTTP Methods - URLs - HTTP Headers : General Headers, Request Headers, Response Headers - Cookies - Status Codes-Design Flaws in Authentication Mechanisms - Implementation  
Flaws in Authentication- Securing Authentication- Attacking Session Management-Weaknesses in Session.

**MODULE IV TOOLS 9**

Using Basic Tools :IFconfig/Ipconfig, Whois, Nslookup, PING, Traceroute, Telnet, Secure Shell. Monitoring Tools: Nagios, Solar Winds, SQL injection attack- Cross-Site Scripting (XSS) - Payloads for XSS Attacks - Delivery Mechanisms for XSS Attacks.

**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, Reporting and redressal mechanism for violations and misuse of Social media platforms. Password Change Function, Beating a Business Limit, inspection of code.

**L –45 ; 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.
3. Andrew Huffman, "Web Application Security: Exploitation and Counter Measures for Modern Applications", O'ReillyMedia Publishing, March 1 st Edition, 2020.

**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 and websites

**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) :**17<sup>th</sup> BoS was held on 01.06.2022**Academic Council:**19<sup>th</sup> Academic Council Meeting  
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	PSO 2
CO1			L											
CO2			M		H									
CO3				H	M				L					
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.

Statement : 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 from them and teach others how to do it too.

<b>CAD 3104</b>	<b>CLOUD SERVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Understand the basic concepts of cloud services.

**COB2:** Impart the knowledge of cloud architecture.

**COB3:** Learn to manage various cloud services.

**COB4:** Provide the necessary training for functionalities of cloud services providers and tools.

**COB5:** Learn the real-life applications of cloud deployment.

**MODULE I INTRODUCTION 9**

Introduction to Cloud Computing, History and Evolution of Cloud Computing, –Types of Deployment Models - Public, Private, Hybrid and Multi-Clouds -Services of Cloud - IaaS – PaaS – SaaS - Storage as a Services – Features and Benefits of Cloud Services.

**MODULE II CLOUD ARCHITECTURE 9**

Cloud Computing Technology–Cloud Architecture– Cloud Modeling and Design -Virtualization: Foundation –Grid, Cloud and Virtualization – Virtualization and Cloud Computing

**MODULE III MANAGING CLOUD SERVICES 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 IV CLOUD SERVICE PROVIDERS AND TOOLS 9**

Overview of Cloud Providers - Microsoft Azure: - Fundamental Concept, Architectural Components, Database, Analytics – AWS: - Fundamentals, Architecture and Frameworks – GCP: - Fundamentals, Core Infrastructure.

AWS Machine Learning Tools - AWS EMR - Amazon Glue - AWS SageMaker – Azure Weka.

**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. Ibrahim, 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.
3. 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:**

1. 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):**

19<sup>th</sup> BoS of CA held on 13.2.2023

**Academic Council:**

20<sup>th</sup> Academic council held on  
13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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

<b>CAD 3105</b>	<b>SOFTWARE TESTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 09</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

The objective of the course is to help students to

**COB1:** Learn about the fundamentals of Software Testing

**COB2:** Understand various levels of testing.

**COB3:** Learn about how to design test cases using different techniques

**COB4:** Know about the various testing tools available

**COB5:** Understand how to manage and control the software testing process.

**MODULE I INTRODUCTION TO TESTING 9**

Testing as a Process – Testing Maturity Model- Testing axioms – Software Testing Principles –Tester’s Role in a Software Development Organization - Software Testing Life cycle(STLC) -Bug(Defect) Life Cycle.

**MODULE II LEVELS OF TESTING 9**

Need for Levels of Testing – Unit Testing – Integration testing –System Testing-User Acceptance testing (UAT) – Types of Testing : Black box testing and White box testing – Regression Testing– Smoke testing - Sanity testing - Ad-hoc testing – Alpha and Beta Tests – Usability and Accessibility testing – Configuration testing –Compatibility testing.

**MODULE III TEST CASE DESIGN TECHNIQUES 9**

Overview–Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – Random Testing – Requirements based testing –White Box Approach to Test design – Static testing vs Structural testing– Coverage and Control Flow Graphs – Covering Code Logic – Paths – Code complexity testing.

**MODULE IV TESTING TOOLS 9**

Software test automation – Skills needed for automation – Scope of automation – Challenges in testing automation - Requirements for a test tool – Functional Testing using Selenium- Performance Testing using JMeter- Mobile Testing using Appium- API Testing.

**MODULE V TEST MANAGEMENT AND CONTROL****9**

Organization structures for testing teams – Test Planning – Test management tool – Test process – Defect Reporting and defect tracking - Reporting Test Results – Case studies in Testing.

**P - 45;TOTAL HOURS – 45****TEXT BOOKS:**

1. Glenford J.Myers, Corey Sandler, Tom Badgett-The Art of Software Testing-3<sup>rd</sup> Edition, John Wiley & Sons,2015
2. Srinivasan Desikan and Gopaldaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2006.

**REFERENCES:**

1. Paul C.Jorgensen,-Software Testing: A Craftsman’s Approach, Fourth Edition, Auerbach Publications ,2013
2. Aditya P. Mathur, —Foundations of Software Testing \_ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education,2008.

**COURSE OUTCOMES:**

On completion of this course, students will

**CO1:** Describe the basic concepts of testing

**CO2:** Categorize the different levels of testing

**CO3:** Design suitable test cases

**CO4:** Use automated testing tools

**CO5:** Develop and validate a test plan

**Board of Studies (BoS):**

19<sup>th</sup> BoS of CA held on 13.2.2023

**Academic Council:**

20<sup>th</sup> 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
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.

**Statement :**The basics of Software Testing were taught in this course to understand the insights and importance of testing and this subject, will motivate the student to deploy the knowledge acquired on real time applications

<b>CAD 3106</b>	<b>FULL STACK DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**COURSE OBJECTIVES:**

**COB1:** Comprehend HTML, CSS, and JavaScript.

**COB2:** Familiarize ReactJS and AngularJS in single page applications.

**COB3:** Explain HTML, CSS, JavaScript, ReactJS and AngularJS in client side application.

**COB4:** Explore Node.JS, Express and MongoDB for server side scripting.

**COB5:** Develop a simple full stack application.

**LIST OF PROGRAMS**

1. Create simple static webpage using HTML.
2. Create a web page to your class timetable HTML table.
3. Create a admission form for the university that uses HTML tags input-text, password, radio, checkbox, button, submit, reset, label, text area, select, option, file upload.
4. Create a simple webpage using HTML and different types of CSS.
5. Create simple webpage using HTML and CSS box model.
6. Create a form and validate the contents of the form using JavaScript.
7. Design a HTML page that accepts student's five subject internal and external marks and when result button pressed the JavaScript function process the exam marks and display the results.
8. Create a counter using ReactJS
9. Create a simple calculator using React JS.
10. Create a Single Page Application using AngularJS.
11. Create a Todo application using AngularJS and NodeJS.
12. Create a NodeJS server without using Express.
13. Create a NodeJS server using Express.
14. Create a simple Login page with validation using AngularJS, NodeJS and MangoDB.
15. Create a NodeJS server using Express that read and manipulates the student's information obtained from a HTML form and stores them in MongoDB database.

**P- 60; Total Hours – 60**



**REFERENCES:**

1. Jon Ducket, "HTML & CSS Design and Build Websites", John Wiley & Sons, Inc., 2011
2. John Dean, "Web Programming with HTML5, CSS, and JavaScript", Jones & Bartlett Learning, 2019
3. Stephen Radford, "Learning Web Development with Bootstrap and AngularJS", 2015 Packt Publishing
4. Shama Hoque, "Full-Stack React Projects Full-Stack React Projects", Second Edition, Packt Publishing, 2020.
5. Vasan Subramanian, "Pro MERN Stack Full Stack Web App Development with Mongo, Express, React, and Node", Second Edition, Apress, 2019.
6. 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.

**COURSE OUTCOMES:**

**CO1:** Create a static web page using HTML5, CSS, JavaScript,

**CO2:** Build a interactive and responsive web pages using Javascript, ReactJS, AngularJS.

**CO3:** Apply Node.js and Express to build a webserver.

**CO4:** Connect Node.js with MonogoDB.

**CO5:** Implement a full stack single page application and deploy in cloud.

**Board of Studies (BoS) :**

19<sup>th</sup> BoS was held on 13.2.2023

**Academic Council:**

20<sup>th</sup> meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			H		H	H					H		H	
CO2		H	H		H	H		H	H		H		H	h
CO3		H	H		H	H		H	H				H	H
CO4			H		H	H		H	H					
CO5	H	H	H	M	H	H	M	H	H	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:**

This course covers latest web development technologies. It will motivate the student to design interactive and responsive web pages and develop real time web and mobile applications independently.

<b>CAD 3107</b>	<b>CLOUD SERVICES LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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.

**P – 60; 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 system in AWS.

**CO4:** Building a big data pipeline in Amazon EMR.

**CO5:** Solve the real-world applications in cloud environments.

### Board of Studies (BoS):

19<sup>th</sup> BoS of CA held on 13.2.2023

### Academic Council:

20<sup>th</sup> Academic council held on  
13.04.2023

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1						L						L			H
CO2		L		L					M					L	
CO3					L			L				M			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).

**SEMESTER VI**

<b>CAC 3201</b>	<b>ENTERPRISE APPLICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>DEVELOPMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 NODEJS 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 Type Script - Setting Up an Enterprise-Level App - Building a Dashboard

**MODULE V APPLICATION DEVELOPMENT****9**

Dashboard creation for data science projects - Capstone projects.

**L – 45; 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):**19<sup>th</sup> BoS of CA held on 13.2.2023**Academic Council:**20<sup>th</sup> Academic council held on  
13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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.

<b>CAD 3202</b>	<b>PROJECT WORK</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>12</b>

**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**

<b>S.No</b>	<b>Description</b>	<b>% Marks Allotted</b>
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.N o	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
	<b>Total</b>	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.

	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.

<b>CAD 3203</b>	<b>DATA VISUALIZATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**COURSE OBJECTIVES:**

**COB1:** Imbibe the basic concepts and techniques of data visualization.

**COB2:** Understand the visualization methods for data related to associations, time series and trends.

**COB3:** Impart the learning of visualizing distributions and proportions

**COB4:** Discuss the components involved in visualization

**COB5:** Expose the visualization techniques for ethical problems

**MODULE I INTRODUCTION TO DATA VISUALIZATION 9**

Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools.

**MODULE II DATA VISUALIZING METHODS 9**

Mapping - Time series - Connections and correlations - Scatterplot maps - Trees, Hierarchies and Recursion - Networks and Graphs, Info graphics.

**MODULE III TABLEAU 9**

Installing Tableau Desktop-Preparing Your Data for Analysis -The Sample Dataset -Finding the Dataset - The Tableau Workspace -The Data Pane - Working with Measures and Dimensions -Working with Marks -Working with Color -Saving, Opening, and Sharing Your Workbooks.

**MODULE IV POWER BI & QUICK SIGHT 9**

Introduction to Power BI – Need, Importance of Power BI – Advantages and Scalable Options – Power BI Data Source Library and DW Files - Power BI Desktop – Installation, Usage - Reports and Visualization Controls - Quick Sight - Overview – Quick Sight using data source.

**MODULE V USE CASES 9**

Case Studies: Compare and Contrast real-world examples Flowing Data - Nathan Yau Information is Beautiful Tableau Vizzes in the wild - Discussions on privacy, security, ethics.

**PRACTICALS****List of Experiments**

1. Demonstrate the Tableau Desktop installation
2. Working with sample dataset in a Tableau Workspace
3. Working with Data Tables
4. Apply Graphical tools for data elaboration
5. Create a story with Tableau
6. Demonstrate graph Using colour palettes.
7. Demonstrate and Plot graphs
8. Create report using Power BI & Quick Sight

**L – 45 ; P – 15 ; TOTAL HOURS – 60**

**TEXT BOOKS:**

1. “Fundamentals of Data Visualization”, Claus O. Wilke, O'Reilly Media, Inc, 2019.
2. “Visual Analytics with Tableau”, Alexander Loth, May 2019.

**REFERENCES:**

1. Hands-On Data Visualization with Bokeh, By Kevin Jolly, June 2018.
2. “Python Data Science Handbook Essential Tools for Working with Data”, Jake VanderPlas, O'Reilly Media, 2016.

**COURSE OUTCOMES:**

**CO1:** Investigate the basic elements regarding the data visualization.

**CO2:** Produce the visualization of associations, time series data and trends.

**CO3:** Analyze the methods needed for visualizing distributions and proportions in tableau.

**CO4:** Acquire knowledge about the Power BI and Quick Sight techniques in the visualization process.

**CO5:** Distinguish and analyze ethical problems that occur in business and society.

**Board of Studies (BoS):**

19<sup>th</sup> BoS of CA held on 13.2.2023

**Academic Council:**

20<sup>th</sup> Academic council held on 13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	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:**

The practice of translating information into a visual context, such as a map or graph, aids to make the data easier for the human brain to understand and draw insights, which results in construction of a resilient software and remarkable innovations.

**PROGRAMME ELECTIVE – I**

<b>CADX 250</b>	<b>E-COMMERCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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                    9**  
**DESIGNING 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 Ronald Anderson.
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, January 2002.
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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> 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 .



<b>CADX 251</b>	<b>INFORMATION RETRIEVAL</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 TanveerSiddiqui 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. Cheng XiangZhai, 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) :**

**Academic Council:**

16<sup>th</sup>BoS of CA held on 23.12.2021 18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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.

<b>CADX 252</b>	<b>SOCIAL MEDIA ANALYSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 5<sup>th</sup> 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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PO 12	PSO 1	PS O2
CO1				M			H						H	
CO2		M		M									M	
CO3							M				M			M
CO4				L			M							L
CO5							L				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.

<b>CADX 253</b>	<b>ONLINE ADVERTISEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>MODULE I</b>	<b>INTRODUCTION TO INTERNET ADVERTISING</b>	<b>09</b>
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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.

<b>MODULE II</b>	<b>SEARCH ENGINE OPTIMIZATION(SEO)</b>	<b>09</b>
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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.

<b>MODULE III</b>	<b>SOCIAL MEDIA MARKETING (SMM)</b>	<b>09</b>
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Definition of Social Media Marketing & Social Media – Identifying Goals for Social Media Marketing such as eWOM, Customer Evangelists – Face book 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.
2. 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)

**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:** The objective of the course is to understand about the Internet in advertising and the process of selling in online through advertisements.



**CO2:** Develop, evaluate, and execute a comprehensive digital marketing strategy and plan.

**CO3:** 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.

**CO4:** Familiarise about the methodologies, tools and technologies involved in digital marketing and Explore the latest digital ad technologies.

**CO5:** 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.

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	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	L	L		M			L		M	L	H
CO3				H	H			M		L			M	
CO4			H		H			L	H		H	H	M	H
CO5						L	H	L	H		H	H	H	H

**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.

<b>CADX 254</b>	<b>PHP PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG 9:</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

The objective of the course is to,

**CO1:** Learn how to build good web applications using PHP language.

**CO2:** Install PHP and work with arrays and regular experiments.

**CO3:** Perform fundamental database operations.

**CO4:** Ability to handle the exceptions and sessions.

**CO5:** 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.

**MODULEIV PHP WITHMYSQL 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 WITHMYSQL 9**

Web Development Frameworks – Introduction –Yii Fundamental concepts of Yii–PHP XML Parsers-PHP XML Expat-PHPXMLDOM-Ajax PHP-PHP

Mail.

**L – 45; Total Hours - 45**

**TEXTBOOK:**

1. KevinTatroe,PeterMacIntyre,RasmusLerdorf,“ProgrammingPHP”,CreatingDynamicWebPages,O'ReillyMedia,3rdEdition,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:**

**CO2:** Test and debug PHP application.

**CO3:** Apply the Model View controller pattern or web applications.

**CO4:** Pass information from client browser to web server for transaction processing.

**CO5:** Work with high- performance PHP framework for developing Web2.0 applications.

**Board of Studies (BoS) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
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 sustainable industrialization 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.

<b>CADX 255</b>	<b>FUNDAMENTALS OF BLOCKCHAIN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>TECHNOLOGY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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):**20<sup>th</sup> BoS of CA held on 17.05.2024**Academic Council:**22<sup>nd</sup> 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.

<b>CADX 256</b>	<b>INTRODUCTION TO DATA ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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):**20<sup>th</sup> BoS of CA held on 17.05.2024**Academic Council:**22<sup>nd</sup> ACM held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	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**

<b>CADX 150</b>	<b>HEALTHCARE ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 3</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 1<sup>st</sup> Edition, UK, 2018.

**REFERENCES:**

1. Nilanjan Dey, Amira Ashour, Simon James Fong, Chintan Bhatl, “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 data analysis.

**CO5:**Design emergency care system using health data analysis

**Board of Studies (BoS) :**

18<sup>TH</sup> BOS held on 15.11.2022

**Academic Council:**

20<sup>th</sup> 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

**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.

**CADX 151****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 (Dockers 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) :**

18<sup>TH</sup> BOS held on 15.11,2022

**Academic Council:**

20<sup>th</sup> 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.



<b>CADX 152</b>	<b>HUMAN RESOURCE ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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) :**

18<sup>TH</sup> BOS held on 15.11,2022

### **Academic Council:**

20<sup>th</sup> meeting of AC held on 13.4.23

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PSO 2
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.

<b>CADX 153</b>	<b>WEB MINING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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) :**

18<sup>TH</sup> BOS held on 15.11,2022

**Academic Council:**

20<sup>th</sup> 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.

<b>CADX 154</b>	<b>HUMAN COMPUTER</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>INTERACTION</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 – 45; 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 Edition, Helen Sharp, Jennifer Preece, Yvonne Rogers, Wiley Publications, 2019.
4. The Wiley Handbook of Human Computer Interaction Set Hardcover – 2, Kent Norman, Jurek Kirakowski, Wiley Publications March 2018.
5. Dream tech Interaction Design, Preece, 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) : Academic Council:**18<sup>TH</sup> BOS held on 15.11,202220<sup>th</sup> meeting 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	PSO 2
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.

<b>CADX 155</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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) :**

18<sup>TH</sup> BOS held on 15.11,2022

**Academic Council:**

20<sup>th</sup> 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.

<b>CADX 156</b>	<b>FUNDAMENTALS OF DATA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>SCIENCE</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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) :**

18<sup>TH</sup> BOS held on 15.11,2022

**Academic Council:**

20<sup>th</sup> 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	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**

<b>GEDX 302</b>	<b>AI FOR eCOMMERCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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) :**

23<sup>rd</sup> BoS of ECE held on  
13.07.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 306</b>	<b>BUILDING REPAIR SOLUTIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 11</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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", 4<sup>th</sup> Edition, New Age International, 2012
2. Gambhir, M.L., "Concrete Technology", 5<sup>th</sup> 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" 4<sup>th</sup> 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):**

18<sup>th</sup> BoS of CE held on 05.04.2023

**Academic Council:**

20<sup>th</sup> 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.

<b>GEDX309</b>	<b>CONSUMER ELECTRONICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4,9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 2<sup>nd</sup> edition, 2010.
4. Whitaker Jerry & Benson Blair, Mastering Digital Television: The Complete Guide to the DTV Conversion, McGraw-Hill Professional, 5<sup>th</sup> edition, 2006.
5. Whitaker Jerry & Benson Blair, Standard handbook of Audio engineering, McGraw-Hill Professional, 2<sup>nd</sup> edition, 2002.
6. Yashwant Kanetkar, "21 Internet of Things Experiments", Kindle edition, BPB, January 2018
7. Mourade Azrou, 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) :**

23<sup>rd</sup> BoS of ECE held on  
13.07.2022

**Academic Council:**

19<sup>th</sup> 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.



<b>GEDX 311</b>	<b>CUSTOMER RELATIONSHIP</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>MANAGEMENT ANALYTICS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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", 1<sup>st</sup> Edition, Tata McGraw Hill, June 2017.
2. 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", 3<sup>rd</sup> Edition, 2015.

**REFERENCES:**

1. Ed Peelen and Rob Beltman, "Customer Relationship Management", 2<sup>nd</sup> 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) :**

16<sup>th</sup>BoS of CA held on 23.12.2021

**Academic Council:**

18<sup>th</sup> 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.

<b>GEDX 313</b>	<b>DISASTER MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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. Sulphrey, 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) :**

18<sup>th</sup> BoS of CE held on 05.04.2023

**Academic Council:**

20<sup>th</sup> 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.

<b>GEDX 320</b>	<b>INDUSTRIAL SAFETY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 14<sup>th</sup> 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):**

20<sup>th</sup> BOS held on 08.08.2022

**Academic Council:**

19<sup>th</sup> Academic Council held on  
29.09. 2022



	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	M	L	M			M	L	L				L	L	L
C02	M	L	M			M	L	L				L	L	L
C03	M	L	M			M	L	L				L	L	L
C04	L	L	M			M	L	L		L		L	L	L
C05	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.

<b>GEDX 321</b>	<b>INTERNET OF THINGS AND ITS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4, 9</b>	<b>APPLICATIONS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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)", 1<sup>st</sup> 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) :**

23<sup>rd</sup> BoS of ECE held on 13.07.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 325</b>	<b>MOTOR VEHICLE ACTS AND LOSS ASSESSMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 9  
TRANSPORT AUTHORITIES**

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 9  
AND PENALTY FOR MOTOR VEHICLES**

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, 1<sup>st</sup> 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, 2<sup>nd</sup> edition, 2013. (ISBN-13 :978-8186976708)
4. "The motor vehicles act, 1988”, Asia law house Publishing, 17<sup>th</sup> 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”, 16<sup>th</sup> 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) :**

14<sup>th</sup> Board of Studies held on 22.08.22

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 338</b>	<b>VEHICLE MAINTENANCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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:**

19<sup>th</sup> 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	PSO 2
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.

<b>GEDX 339</b>	<b>WASTEWATER MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 3<sup>rd</sup> 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) :**

18<sup>th</sup> BoS of CE held on 05.04.2023

**Academic Council:**

20<sup>h</sup> Academic Council held on

23.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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.