REGULATIONS 2016

CURRICULUM AND SYLLABI

B.C.A.
BACHELOR OF COMPUTER APPLICATIONS
(Amendments updated upto Jan 2020)

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.

VISION AND MISSION OF THE

DEPARTMENT OF COMPUTER APPLICATIONS

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.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

The Programme Educational Objectives of B.C.A. (Bachelor of Computer Applications) are listed below:

PEO-1: To give good foundation in mathematics and computing fundamentals required to analyze and solve complex computing problems.

PEO-2: To give technical knowledge in various programming languages to comprehend, analyze, design and create innovative computing solutions for real time and industry projects.

PEO-3: To give project based learning in subjects and training in general aptitude and inculcate an urge for self-learning by providing quality environment for improving communicative efficacy, leadership and personality development.

PEO-4: To create an urge in the young minds of students and motivate them to qualify academically for further studies and meet the dynamic needs of industry with confidence and serving attitude to the society in their successful careers.

PROGRAM OUTCOMES:

The Programme Outcomes of B.C.A. (Bachelor of Computer Applications) are listed below:

PO1: Computational knowledge transfer for mathematical modelingthrough effective teaching and learning processes.

PO2: Identify, define and design the problem requirementengineering metrics with scientific diagrams for real time / industry projects.

PO3: Design and development of solution methodologies and computational algorithms for practical implementation.

PO4: Conduct literature survey and summarize the inferences fromthe proceedings of the technical symposiums.

PO5: Select appropriate software tools for development as well astesting for successful implementation.

PO6: Become a software professional with social responsibilitiesand ethical values.

PO7: Solve societal and environmentally sensitive problems inprofessional manner.

PO8: Be a professional software engineer to manage technologyand configuration change management in the work places.

PO9: Function as individual member or leader of team and able tomanage projects in software development process.

PO10: Comprehend, write effective reports and communicate their innovations and idea in an effective way.

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

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

PROGRAMME SPECIFIC OUTCOMES:

PSO1: To enrich the graduates with necessary design anddevelopment skills for real-time/ industry projects using Cloud Computing / Mobile Applications / Data Analytics / Multimedia Technologies with vertical specialization.

PSO2: To enhance the productivity of graduates in the design and development of software products/services using appropriate tools for real time mobile and desktop applications for different functional levels of an organization.

B.S.ABDURRAHMANCRESCENT INSTITUTE OF SCIENCE & TECHNOLOGY,

REGULATIONS-2016
FOR
BACHELOROFCOMPUTERAPPLICATIONS(B.C.A)/
BACHELOROFSCIENCE(B.Sc)/
BACHELOR OF BUSINESS ADMINISTRATION (B.B.A)/
BACHELOR OF COMMERCE (B.Com)

DEGREEPROGRAMME(SemesterScheme)

(Candidatestobeadmittedfromtheacademicyear2016-2017onwards)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) **"Programme"** means UnderGraduateDegreeProgramme (B.C.A/B.Sc/B.Com/B.B.A).

ii) **"Course"** meansatheoryorpracticalsubjectthatisnormallystudiedinasemester.

iii) **"Institution"** means B.S.Abdur Rahman Crescent Institute of Science & Technology.

iv) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of B.S. Abdur Rahman Crescent Institute of Science & Technology.

v) **"Dean (Student Affairs)"** means the Dean (Students Affairs) of B.S. Abdur Rahman Crescent Institute of Science & Technology.

vi) **"Controller of Examinations"** means the Controller of Examination ofB.S.Abdur Rahman Crescent Institute of Science & Technology, who is responsible for conduct of examinations and declaration of results.

2.0 PROGRAMMEOFFERED,DURATIONANDELIGIBILITYCRITERIA

2.1 U.G.ProgrammesOffered

Degree	Modeof Study
B.C.A	FullTime
B.Sc	FullTime
B.B.A	Full Time
B.Com	Full Time

2.2 DurationoftheProgramme

Thedurationofthe undergraduateprogramshallbesixsemesters (three academicyears).

2.3 EligibilityCriteria

2.3.1 Studentsforadmissionto the firstsemesteroftheundergraduatedegreeprogrammemusthavepassedthe HigherSecondaryCertificateexamination or anyotherexamination ofanyauthorityacceptedbythisInstitutionasequivalentthereto.

S.No	Programme	Eligibility Criteria
1	B.C.A	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 Bio Technology	10 +2 (Higher Secondary) with Chemistry as one of the subjects.
4	B.B.A (Financial Services)	10 +2 (Higher Secondary) with any stream or equivalent
5	B.Com General	10 +2 (Higher Secondary) with Mathematics, Physics and Chemistry/Physics, Chemistry, Botany and Zoology /Commerce /Statistics as subjects.
6	B.Com (Accounts and Finance)	

2.3.2 Eligibility conditions for admission such as marks obtained, number of in the qualifyingexaminationandphysicalfitnesswillbeasprescribedbythisInstitutionfrom time totime.

2.4 StreamsofStudy

Takingintoconsiderationtherapiddevelopmentsintechnology and to cater the needs of the industry,thefollowing programmes areoffered

S.No	Program	Streams of Study
1.	B.C.A	i. Specialization in CloudTechnologyandInformationSecurity ii. SpecializationinMobileApplications and

		InformationSecurity iii. Specializationin Data Science, iv. Specialization in Multimedia and Web Application Development
2.	**B.Sc**	i. ComputerScience ii. Bio Technology
3.	**B.B.A**	i. Financial Services
4.	**B.Com**	i. General ii. Accounts and Finance

3.0   STRUCTURE OF THE PROGRAMME

3.1   TheUGProgramme consistsofthefollowingcomponentsasprescribedinthe curriculum

- CoreCourses
- Allied Courses
- ElectiveCourses
- Laboratory courses
- Laboratory integrated theory courses
- ValueaddedCourses
- ProjectWork

3.2   Thecurriculaandsyllabiof all UGprogrammesshallbeapprovedbyBoardofStudies of the respective department andAcademicCouncilofthisInstitution.

3.3   Each course is normally assigned certain number of credits :

- Onecreditforonelectureperiodperweek.
- Onecreditforonetutorialperiodperweek.
- Onecrediteachforlabsessions/projectoftwoorthreeperiodsperweek.
- Onecrediteachforvalueaddedcoursesoftwoorthreeperiodsperweek.

3.4   The medium of instruction, examinations and project report shall be English, except for courses in languages other than English.

3.5   Theminimumnumberofcreditstobeearnedforthesuccessfulcompletionoftheprogr am shall be normally in the range as follows:

S.No	Programme	Credits
1	B.C.A	120 - 126

2	B.Sc. (Computer Science)	120 – 126
3	B.Sc. (Bio Technology)	145 – 150
4	B.B.A (Financial Services)	120 - 125
5	B.Com	150 – 158
6	B.Com (Accounts and Finance)	150 – 158

3.6 Thenumberofcredits registeredby astudentin non-projectsemesterandprojectsemester shall be normally intherangeasfollows:

NonProjectSemester: 20-28

ProjectSemester: 19-27

3.7 Elective courses from the curriculaare to be chosen with the approval of the Head of the Department/ Dean of School

4.0 DURATION OF THE PROGRAMME

4.1 The minimum and maximum periods for the completion of the UG programmes are three years (6 semesters) and five years (10 semesters) respectively.

4.2 Each semester shall consist of a minimum of 90 working days.

4.3 Semester end examination will normally follow within a week after the last working day of the semester.

5.0 CLASS ADVISOR AND FACULTY ADVISOR

5.1 Class Advisor

A faculty member will be nominated by the HOD/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.

5.2 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 advisor 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.

6.0   COURSE COMMITTEE

Each common theory course offered to more than one group of students shall have a "Course Committee" comprising all the teachers 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 of School / Dean (Academic Affairs) depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The Course Committee shall meet as often as possibleandensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the Course Committee may also prepare a common question paper for the test(s).

7.0   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.

7.1   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
- Faculty members of all 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-OfficioMember

7.2   The class committee shall meet at least four times during the semester. The first meeting will be held within two weeks from the date of commencement of classes, in which the nature of continuous assessment for various courses and the weightages for each component of assessment will be decided for the first and second assessment. The second meeting will be held within a week

after the date of first assessment report, to review the students' performance and for follow up action. The third meeting will be held within a week after the second assessment report, to review the students' performance and for follow up action.

7.3   During these three meetings the student members representing the entire class, shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process.

7.4   The fourth meeting of the class committee, excluding the student members, shall meet within 5 days from the last day of the semester end examination to analyze 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 concerned course coordinator.

8.0   REGISTRATION AND ENROLMENT

8.1   Except for the first semester, every student shall register for the ensuing semester during a specified week before the semester end examination of the ongoing semester. Every student shall submit a completed registration form indicating the list of courses intended to be enrolled during the ensuing semester. Late registration with the approval of the Dean (Academic Affairs) along with a late fee will be permitted up to the last working day of the current semester.

8.2   From the second year onwards, all students shall pay the prescribed fees for the year on or before a specific day at the beginning of the semester confirming the registered courses. Late enrolment along with a late fee will be permitted up to two weeks from the date of commencement of classes. If a student does not enroll, his/her name will be removed from rolls.

8.3   The students of first semester shall register and enroll at the time of admission by paying the prescribed fees.

8.4   A student should have registered for all preceding semesters before registering   for a particular semester.

9.0 COURSE CHANGE/ WITHDRAWAL

9.1   Change of a 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.

9.2   Withdrawal from a Course

A student can withdraw from an enrolled course at any time before the first 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.

10.0   TEMPORARY BREAK OF STUDY FROM A PROGRAMME

A student may be permitted by the Dean (Academic Affairs) to avail temporary break of study from the programme up to a maximum of two semesters for reasons of ill health or other valid grounds. A student can avail the break of study before the start of first assessment of the ongoing semester. However the total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 4.1).If any student is debarred for want of attendance or suspended due to any act of indiscipline, it will not be considered as break of study. A student who has availed break of study has to rejoin in the same semester only.

11.0   ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

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

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

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

meeting.

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

11.4   Every practical course will have 60% weightage for continuous assessments and 40% for semester end examination. However a student should secure a minimum of 50% of the marks in the semester end practical examination.

11.5   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 component. Grading shall be done for this consolidated mark. Assessment of theory component 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 component shall be through continuous assessment.

11.6   In the case of Industrial training /Internship, the student shall submit a report, which will be evaluated along with an oral examination by a committee of faculty members, constituted by the Head of the Department/ Dean of School. The weightage for report shall be 60% and 40% for Viva Voce examination.

11.7   In the case of project work, a committee of faculty members constituted by the Head of the Department/ Dean of School will carry out three periodic reviews. Based on the project report submitted by the student(s), an oral examination (viva-voce) will be conducted as the semester end examination, for which one external examiner, approved by the Controller of Examinations, will be included. The total weightage for all periodic reviews will be 50%. Of the remaining 50%, 20% will be for the project report and 30% for the Viva Voce examination.

11.8   Assessment of seminars and comprehension will be carried out by a committee of faculty members constituted by the Head of the Department/ Dean of School.

11.9   For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance will 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 the course of study shall be ignored.

12.0   SUBSTITUTE EXAMINATIONS

12.1   A student who has missed, for genuine reasons, a maximum of one of the two continuous assessments of a course may be permitted to write a substitute examination paying the prescribed substitute examination fees. However, permission to write 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 Dean of School for that purpose. However there is no Substitute Examination for Semester End examination.

12.2   A student who misses any continuous assessment test in a course shall apply for substitute exam in the prescribed form to the Head of the Department / Dean of School within a week from the date of missed assessment test. However the Substitute Examination will be conducted after the last working day of the semester and before Semester End Examination.

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% (for genuine reasons such as medical grounds or representing the Institution in approved events etc.) 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. For the courses in which "I" grade is awarded, the student shall register and repeat the course when it is offered next.

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 that course to the Class Advisor. The Class Advisor will consolidate and furnish the list of students who have earned less that 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department/ Dean of School. Thereupon, the Dean (Academic Affairs) shall announce the names of such students prevented from writing the semester end examination in each course.

13.3 A student who has obtained 'I' grade in all the courses in a semester is not permitted to move to next higher semester. Such student shall repeat all the courses of the semester in the subsequent academic year.

13.4 A student should register to re-do a core course wherein "I" or "W" grade is awarded. If the student is awarded, "I" or "W" 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 School.

13.5 A student who is awarded "U" grade in a course will have the option either to 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 during the redo classes shall be considered for grading along with the marks scored in the semester-end (redo) examination. If any student obtained "U" grade in the redo course, the marks scored in the continuous assessment test (redo) for that course will be considered as internal mark for further appearance of arrear examination.

13.6 If a student with "U" grade, who prefers to redo the course, fails to earn the minimum 75% attendance while redoing that course, then he / she will not be 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 two redo courses per semester in the evening after regular college hours, if such courses are offered by the concerned department. Students may also opt to redo the courses offered during regular semesters.

14.2 The Head of the Department, with the approval of Dean Academic Affairs, may arrange for the conduct of a few courses during the evening, depending on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

14.3   The number of contact hours and the assessment procedure for any redo course will be the same as those during regular semesters except that there is no provision for any substitute examination and withdrawal from an evening redo course.

15.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

15.1 All assessments of a course will be made on absolute marks basis. The Class Committee, without the student members, shall meet within 5 days after the semester-end examination and analyze the marks of students in all assessments of a course and award suitable letter grades. 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	0
I	0
AB	0

"W" denotes withdrawal from the course.

"I" denotes inadequate attendance and hence prevention from semester-end examination

"U" denotes unsuccessful performance in the course.

"AB" denotes absence for the semester-end examination.

15.2 A student who earns a minimum of five grade points 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 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department/Dean of Schools and the results shall be declared by the Controller of Examinations.

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 Controller of Examination. Subsequently the Head of the Department/ Dean of

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 member of faculty knowledgeable in that course. 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 will contain the following details:

- credits foreachcourseregisteredforthatsemester.
- performanceineachcoursebythelettergradeobtained.
- totalcreditsearnedinthatsemester.
- GradePointAverage(GPA)ofallthecoursesregisteredforthatsemesterandthe

  CumulativeGradePointAverage(CGPA)ofallthecoursestakenuptothatsemester.

If Ci, is the number of credits assigned for the ith course and GPi is the Grade Point in the ith course, GPAwillbecalculatedaccordingtotheformula

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

Where n = number of courses

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

"I" and "W" grades will be excluded for calculating GPA.

"U", "I", "AB" and **"W"** grades will be 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 will be awarded with the following classifications based on CGPA.

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within

	the Prescribed period of 6 semesters.
First Class	6.50andabove,havingcompletedwithinaperiodof 8semesters.
Second Class	Others

However, to be eligible for First Class with Distinction, a student should not have obtained 'U' or 'I' grade in any course during his/her study and should have completed the U.G. programme within 6 semesters (except break of study). To be eligible for First Class, a student should have passed the examination in all the courses within 8 semesters reckoned from his/her commencement of study. For this purpose, the authorized break of study will not be counted. The successful students who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to two decimal places. For the purpose of comparison of performance of students and ranking, CGPA will be considered up to three decimal places.

16.0 ELECTIVE CHOICE:

16.1 Apart from the various elective courses listed in the curriculum for each programme, the student can choose a maximum of two electives from any stream of the same program during the entire period of study, with the approval of the Head of the parent department and the Head of the other department offering the course.

16.2 Online / Self Study Courses

Students are permitted to undergo department approved online/ self study courses not exceeding a total of six credits 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. In case of credits earned through online mode ratified by the respective Board of Studies, the credits may be transferred following the due approval procedures. The students shall undergo self study courses on their own with the mentoring of a member of the faculty. The online/ self study courses can be considered in lieu of elective courses.

17.0 SUPPLEMENTARY EXAMINATION

Final Year students can apply for supplementary examination for a maximum of two 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.

18.0 PERSONALITY AND CHARACTER DEVELOPMENT

18.1 All students shall enroll, on admission, in any of the personality and character development programmes, NCC / NSS / NSO / YRC / Rotaract and undergo practical training.

- **National Cadet Corps (NCC)** will have to undergo specified number ofparades.
- **National Service Scheme (NSS)** will have social service activities inand around Chennai.
- **National Sports Organization (NSO)** will have sports, games, drillsand physical exercises.
- **Youth Red Cross (YRC)** will have social service activities in and aroundChennai.
- **Rotaract** will have social service activities in and around Chennai.

19.0 DISCIPLINE

19.1 Every student is required to observe disciplined and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to affect the prestige of the Institution.

19.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean will be referred to a Discipline and Welfare Committee nominated by the Vice-Chancellor, for taking appropriate action.

20.0 ELIGIBILITY FOR THE AWARD OF DEGREE

20.1 A student shall be declared to be eligible for the award of 3 year Bachelor provided the student has:

i) Successfully completed all the required courses specified in the programme curriculum and earned the number of credits prescribed for the specialization, within a maximum period of 10 semesters. from the date of

admission, including break of study

ii) no dues to the Institution, Library, Hostels

iii) no disciplinary action pending against him/her.

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

21.0 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.

B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY
CURRICULUM & SYLLABI FOR
BACHELOR OF COMPUTER APPLICATIONS
(SIX SEMESTERS / FULL TIME)

SEMESTER I

Sl. No	Course Code	Course Title	L	T	P	C
1.	ENC 1183	General English – I	3	0	0	3
2.	MAC 1187 / MAC 1188	Algebra, Calculus and Trigonometry/ Discrete mathematics	3	1	0	4
3	CAC 1108	Communication Skills	0	0	2	1
4	CAC 1102	Computer Fundamentals and Organization	3	0	0	3
5	CAC 1103	Programming in C	3	0	0	3
6	CAC 1107	Operating Systems and Introduction to Linux	3	0	0	3
7	CAC 1109	Programming in C – Laboratory	0	0	4	2
8	CAC 1110	Linux Laboratory	0	0	4	2
		Credits				**21**

SEMESTER II

Sl. No	Course Code	Course Title	L	T	P	C
1	ENC 1284	General English – II	3	0	0	**3**
2	MAC 1288	Probability and Statistics	3	1	0	**4**
3	CAC 1203	OOPS with C++	3	0	0	**3**
4	CAC 1204	Data Structures Using C	3	0	0	**3**
5	CAC 1256	Environmental Studies	2	0	0	**2**
6		**Technology Elective I**	3	0	0	**3**
7	CAC 1208	OOPS with C++ - Laboratory	0	0	3	**2**
8	CAC 1209	Data Structures Using C - Laboratory	0	0	3	**2**
		Credits				**22**

SEMESTER III

Sl. No	Course Code	Course Title	L	T	P	C
1	CAC 2101	Reasoning and Thinking	3	0	0	**3**
2	CAC 2103	Software Engineering	3	0	0	**3**
3	CAC 2104	RDBMS	3	0	0	**3**
4	CAC 2105	Computer Networks	3	0	0	**3**
5	CAC 2106	Programming in Java	3	0	0	**3**
6		**Technology Elective II**	3	0	0	**3**
7	CAC 2109	RDBMS –Laboratory	0	0	4	**2**
8	CAC 2110	Programming in Java - Laboratory	0	0	4	**2**
		Credits				**22**

SEMESTER IV

Sl. No	Course Code	Course Title	L	T	P	C
1	CAC2216	Introduction to Python	3	0	0	**3**
2	CAC2217	Organizational Behavior	3	0	0	**3**
3		**Technology Elective III**	3	0	0	**3**
4		**Technology Elective IV**	3	0	0	**3**
5		**Technology Elective V**	3	0	0	**3**
6		**Programme Elective –I**	3	0	0	**3**
7	CAC2218	Python Laboratory	0	0	4	**2**
8		**Technology Elective Lab – I**	0	0	4	**2**
		Credits				**22**

SEMESTER V

Sl. No	Course Code	Course Title	L	T	P	C
1	CAC3116	Digital Marketing	3	0	0	**3**
2	CAC3117	Artificial Intelligence	3	0	0	**3**
3		**Technology Elective VI**	3	0	0	**3**
4		**Technology Elective VII**	3	0	0	**3**
5		**Technology Elective VIII**	3	0	0	**3**
6		**Programme Elective –II**	3	0	0	**3**
7		**Technology Elective Lab – II**	0	0	4	**2**
8		**Technology Elective Lab – III**	0	0	4	**2**
		Credits				**22**

SEMESTER VI

Sl. No	Course Code	Course Title	L	T	P	C
1.	CAC3204	Enterprise Application development	3	0	0	**3**
2.		**Technology Elective IX**	3	0	0	**3**
3.	CAC3205	Project	0	0	0	**16**
		Credits				**22**

Total Credits: 131

LIST OF ELECTIVES

Sl. No.	Course Code	Course Title	L	T	P	C
		Technology Electives – I				
1	CAC 1211	Fundamentals of Datacenter	3	0	0	3
2	CAC1207	Introduction to Mobile Applications	3	0	0	3
3	CAC1225	Introduction to Data Science	3	0	0	3
4	CAC1231	Multimedia Tools and Techniques	3	0	0	3
		Technology Electives – Ii				
1	CAC2102	Information Security Fundamentals	3	0	0	3
2	CAC2126	Business Intelligence	3	0	0	3
3	CAC2131	Introduction to Scripting Languages	3	0	0	3
		Technology Elective Lab I				
1	CAC2233	Web Design Laboratory	0	0	4	**2**
2	CAC2219	Server Operating System –Laboratory	0	0	4	**2**
3	CAC2210	Android Laboratory	0	0	4	**2**
4	CAC2230	Big Data Analytics Laboratory	0	0	4	**2**
		Technology Electives – III				
1	CAC2231	Web Design and Development	3	0	0	**3**
2	CAC2211	Server Operating System	3	0	0	**3**
3	CAC2206	Mobile and Wireless Security	3	0	0	**3**
4	CAC2223	Big Data Analytics	3	0	0	**3**
		Technology Electives – IV				
1	CAC2203	Cryptography Fundamentals	3	0	0	**3**
2	CAC2222	NoSQL Databases	3	0	0	**3**
		Technology Elective - V				
1	CAC2212	Introduction to Cloud Technology	3	0	0	**3**
2	CAC2209	Introduction to Android Programming	3	0	0	**3**
3	CAC2229	Exploratory Data Analytics	3	0	0	**3**
4	CAC2232	Computer Graphics	3	0	0	**3**
		Programme Elective – I				
1	CACX04	E-Commerce	3	0	0	**3**
2	CACX47	Information Retrieval	3	0	0	**3**
3	CACX48	Social Media Analysis	3	0	0	**3**
4	CACX49	Online Computer Advertising	3	0	0	**3**
5	CACX50	PHP Programming	3	0	0	**3**

6	CACX51	Web Mining	3	0	0	**3**
7	CACX52	Human Computer Interaction	3	0	0	**3**

Technology Electives – VI

1	CAC 3101	Computer Forensics and Investigation	3	0	0	**3**
2	CAC3123	Machine Learning Algorithms	3	0	0	**3**
3	CAC3132	Games, Arts and Design	3	0	0	**3**

Technology Elective VII

1	CAC 3115	R Programming	3	0	0	**3**
2	CAC 3102	Virtualization And Cloud Security	3	0	0	**3**
3	CAC3133	XML And Web Services	3	0	0	**3**

Technology Elective VIII

1	CAC3113	Principles Of Virtualization	3	0	0	**3**
2	CAC3109	IOS Applications	3	0	0	**3**
3	CAC3121	Time Series Analysis	3	0	0	**3**
4	CAC3134	Specialization in 3D Productions	3	0	0	**3**

Programme Elective – II

1	CACX55	Health Care Analytics	3	0	0	**3**
2	CACX56	Agile Methodology	3	0	0	**3**
3	CACX57	Human Resource Management	3	0	0	**3**
4	CACX58	Employability Skills	3	0	0	**3**

Technology Elective Lab II

1.	CAC 3107	Computer Forensics and Investigation - Laboratory	0	0	4	**2**
2.	CAC 3124	Machine Learning Algorithms - Laboratory	0	0	4	**2**
3	CAC 3135	Animation Laboratory	0	0	4	**2**

Technology Elective Lab III

1	CAC 3156	R Programming Laboratory	0	0	4	**2**
2	CAC 3114	Virtualization Laboratory	0	0	4	**2**
3	CAC3110	IOS Laboratory	0	0	4	**2**
4	CAC 3136	XML and Web Services Laboratory	0	0	4	**2**

Technology Elective IX

1	CAC3203	IT governance, Risk and Information security Management	3	0	0	**3**
2	CAC3222	Data Science Project Management	3	0	0	**3**
3	CAC3231	Web and E-Business	3	0	0	**3**

SEMESTER – I

ENC 1183   **GENERAL ENGLISH–I**   **L   T   P   C**

                                                       3   0   0   3

OBJECTIVES:

- To expose students to English literary texts.
- To help them interpret literary texts.
- To exhibit the effective use of the four skills of communication.
- To demonstrate the range of vocabulary and communicate effectively using grammaticallycorrect language.

MODULE I   **8**

Prose	Education
Poem	P.B.Shelley—"Ozymandias"
LetterWriting	Formal Letter - Seeking permission for official purpose (attending conferences,symposium,etc.)
ShortStory	O Henry - "Robe of Peace"(ExtensiveReading) Language Focus—PresentTense

MODULE II   **8**

Prose	Employment &Unemployment Letter of Invitation
ShortStory	Rudyard Kipling – "The Miracle ofPuranBhagat" (ExtensiveReading)Language Focus – Past & future tense.

MODULE III   **8**

Prose	ADeadPlanet
Poem	Robert Herrick - "Gather Ye Rosebuds" NoteMakingLanguage Focus – Affixes.

MODULE IV   **7**

Prose	Riddles
Poem	Oliver Goldsmith - "The VillageSchoolmaster" Language Focus- - Prepositions &Articles.
Short story	William Somerset Maugham- "Mabel" (Extensive Reading).

MODULE V   7

Prose   Galloping Growth

Poem   William Blake - "From Auguriesof Innocence"

Précis Writing   Language Focus   subject verbAgreement.

MODULE VI   7

Poem   Robert Browning- "The LastRide Together"

Developing story from hints

Short story   John Galsworthy- "Quality" (Extensive reading**)**

                         LanguageFocus-Voice

Total Hours -45

REFERENCES:

1. Krishnaswamy.N, SriramanT.,**CurrentEnglishforColleges.**Hyderabad: Macmillan Indian Ltd, 2006.
2. Dahiya SPS. Ed. **Vision in Verse- An Anthology of Poems**. New Delhi: Oxford UniversityPress,2002.
3. Swan,M.(2005). Practical English Usage. OxfordUniversityPress.UK
4. Seshadri, K G Ed. **Stories for Colleges.** Chennai: Macmillan IndiaLtd,2003.

OUTCOMES:

After completing the course the students would beabletoRespond to literary texts efficiently.

- Appreciate and critically analyseliterary texts.
- Use the four skills of the language
- Use vocabulary and grammatical expressions effectively.

MAC1187   **ALGEBRA, CALCULUS AND**   **L   T   P   C**
                 TRIGONOMETRY   **3   1   0   4**

OBJECTIVES:
The objective of the course is to help students to:

* Develop the skills of students in applying basic concepts in chosen topics of mathematics that are imperative for effective understanding of application oriented topics.
* Lay the foundation for learning concepts of Differentiation, Integration and Trigonometry.
* Introduce the concept of Eigen values and eigenvectors ofmatrix algebra.
* Familiarize the students with the functions ofseveral variables.
* Demonstrate the applications of Differential CalculusandTrigonometry.

MODULE I   MATRICES   (9+3)
Symmetric – Skew-Symmetric - Orthogonal and Unitary matrices - Rank of a Matrix - Consistency - Characteristic equation - Eigenvalues and Eigenvectors - properties - Cayley Hamilton's Theorem (proof not needed) - Simple applications.

MODULE II   THEORYOFEQUATIONS   (9+3)
Partial Fractions - Theory of equations- Polynomial Equations with real Coefficients - Irrational roots - Complex roots - Symmetric functions of roots - Transformation of equation by increasing or decreasing roots by a constant - Reciprocal equations.

MODULE III   DIFFERENTIALCALCULUS   (9+3)
Rules of differentiation - Derivative of implicit function - Successive differentiation nth derivatives - Leibnitz theorem (without proof) and applications - maxima and minima of functions of two variables - Partial differentiation - Euler's Theorem.

MODULE IV   INTEGRALCALCULUS   (9+3)
Integration of rational functions - algebraic expressions involving only one irrational quantity- rational functions of sinx and cosx - Trigonometric substitutions - Bernoulli's formula for integration by parts - reduction formulae - properties of definite integral - Evaluation of double and triple integrals.

MODULE V   TRIGONOMETRY   (9+3)

De Moivre's theorem and its application - Circular and Hyperbolic functions – Inverse circular and hyperbolic functions - Expansion of trigonometric functions in terms of power and multiples - Separation of real and imaginary parts of logarithmic - trigonometric and inverse trigonometric functions - Summation of series including C+iS method.

TOTAL HOURS – 60

TEXT BOOKS:

1. Narayanan,S.andManicavachagomPillay,T.K.(2015)CalculusVol.I,II&III S.Viswanathan (Printers & publishers) Pvt.Ltd.,Chennai.
2. Venkataraman, M.K., "Higher Mathematics for Engineering and Science", ThirdEdition, The National Publishing Co.,Madras,1986.
3. Kandasamy P, K. Thilagavathi and K. Gunavathy- Allied Mathematics aper-I, First semester, 1/e, S. Chand & Co., NewDelhi,2003

REFERENCES:

1. Stewart J - Single Variable Calculus (4th edition) Brooks / Cole, CenageLearning2010.
2. Tom M. Apostol - Calculus, Vol. I (second edition) John Wiley and Sons, Inc.,Jan2007.
3. Burnside W.S. and A.W. Panton - The Theory of Equations, Dublin University Press, 1954.
4. MacDuffee, C.C. - Theory of Equations, John Wiley & SonsInc.,1954.
5. Ushri Dutta, A.S.Muktibodh and S.D. Mohagaonkar: Algebra and Trigonometry,PHI India,2006.

OUTCOMES:

After completing the course students would be able to

- Solve Eigen value andeigenvector problems.
- Classify and solve polynomial equations ofdifferent types.
- Differentiate different typesof functions.
- Integrate rational and trigonometric functions and to evaluate definiteintegrals (doubleand triple).
- Demonstrate the application of Demoivre's theorem and find the sum of seriesof trigonometric functions.

MAC1188   **DISCRETE MATHEMATICS**   **L   T   P   C**
                                                            3   1   0   4

OBJECTIVE:

The objective of the course is to help students to:

- Familiarize the basic mathematical ideas and terminologies used incomputer science.
- Introduce and apply the fundamental concepts ofgraph theory.
- Use graph theory based tools in solvingpracticalproblems.
- Understand some basic properties of graphs and related discrete structures, andbe able to relate these topracticalexamples.
- Translate real life situations intodiagrammatic representation

MODULE I   INTRODUCTION   9+3

Graphs – Introduction – Isomorphism - Sub graphs – Walks, Paths, Circuits – Connectedness – Components - Euler graphs - Hamiltonian paths and circuits – TreesRooted and binarytrees.

MODULE II   TREES,CONNECTIVITY&PLANARITY   9+3

Fundamental circuits - Spanning trees in a weighted graph - cut sets – Connectivity and separability - Network flows - 1-Isomorphism - 2-Isomorphism-Combinational and geometric graphs - Planer graphs.

MODULE III   MATRICES,COLOURING ANDDIRECTED GRAPH   9+3

Chromatic number - Chromatic partitioning - Chromatic polynomial – Matching CoveringFour color problem - Directed graphs Digraphs and binary relations - Directed paths and connectedness.

MODULE IV   PERMUTATIONS&COMBINATIONS   9+3

Fundamental principles of counting - Permutations and combinations Binomial theoremcombinations with repetition - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

MODULE V   GENERATINGFUNCTIONS   9+3

Generating functions - Partitions of integers - Exponential generating function - Summation operator - Recurrence relations - First order and second order - Non-homogeneous recurrence relations - Method of generating functions.

TOTAL HOURS: 60

TEXT BOOKS:

1. NarsinghDeo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall ofIndia,2003.
2. Grimaldi R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", AddisonWesley,1994.
3. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 30th Reprint 2011.

REFERENCES:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw-Hill Publishing Company Limited, NewDelhi,2015.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. C.L.Liu, D.P.Mohapatra, "Elements of Discrete Mathematics", 4th Edition, Tata McGraw-Hill Pub. Co. Ltd, NewDelhi,2012.
4. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 30th Reprint 2011.

OUTCOMES:

At the end of the course students will be able to

- Apply principles and concepts of graph theory inpractical situations.
- Apply the basic concepts of mathematical logic to describe and solve somereal time problems using concepts ofgraph theory
- Apply and calculate permutationsand combinations.
- Solve problems involving permutationsand combinations.

CAC1108   **COMMUNICATIONSKILLS**   **L   T   P   C**

                                                       0   0   2   1

OBJECTIVES:

The objective of the course is to help students to:

- Make the students feel the significance of communicating well and how it can have a profound effect in both our professional andpersonal lives.
- Develop professional skills like work ethics, analytical skills, presentationskills
- Train them in problem solving skills and leadership skills pertainingto industries.
- Train them in teambuilding skills.
- Train in setting upcareer goal

MODULE I   **TECHNICAL VOCABULARY**   **6**

Technical Vocabulary, Punctuation, Numerical Expressions, Expanding Acronyms and Abbreviations, Concord, 'If' clauses, Infinitives. Homonyms, Homographs and Homophones, Telephone conversations, Reading Comprehensions, Making of an advertisement.

MODULE II   **BASIC SKILLS-READINGANDSPEAKINGSKILLS**   **6**

Reading and interpretation, Intensive reading, Writing reviews on books and films, Descriptions, Process description, Summarizing, Instructions, Oral presentations. Debate.

MODULE III   **BASIC SKILL:TECHNICALWRITING SKILL**   **6**

Letters – formal, informal, Cover Letter and CV, Synonyms and Antonyms, Indefinite Adjectives, Non-verbal communication, Interactive sessions. Role Plays, Critical reading, Listening andNotetaking.

MODULE IV   **BASIC SKILL:LISTENINGANDSPEAKINGSKILLS**   **6**

Active and Passive Voice, Impersonal Passive, Essay Writing, Comprehension Passage, Editing, Correction of errors, Direct and Indirect,Conversations,Dialogue writing, Discourse Markers. Group activities.

MODULE V   TECHNICALWRITINGANDCOMMUNICATION   6

Reports – Types, structure, data collection, content, form, Definitions, extended definition, Recommendations, Memos, and Checklists. Group Discussions, Listening and comprehendingthe conversations.

TOTAL HOURS –30

TEXT BOOKS:

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd,Chennai:2012.
2. Department of Humanities and Social Sciences, Anna University, "English for Engineers and Technologists" Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt.Ltd.,2006.
3. M.AshrafRizvi, "Effective Technical Communication",TatamcGraw-Hill Publishing Company Limited,NewDelhi.2009.

REFERENCES:

1. Sumant. S, 'Technical English', Second Edition, McGraw-Hill Education (India)Pvt. Ltd.,2008.
2. Dr. M. Hariprasad," Communicative English "Third Edition,NeelkamalPublications, PVT.LTD.,2007.
3. SangeetaSharma,BinodMishra,'CommunicationSkills forEngineersand Scientists, PHI Learning Private Limited., NewDelhi,2009.

OUTCOMES:

At the end of the course students will be able to,

- Students shall overcome their inhibitions and limitations in communicationand becomeeffective communicators.
- Develop reading, listening andspeaking skills.
- Have Technical writing and communication,
- Exhibit critical reading skills through review of industryspecific articles.
- Provide solutions to problembased situations.
- Exhibit leadership qualities by debating over industry specific issues.

CAC1102   **COMPUTER FUNDAMENTALSAND**   L   T   P   C
                 ORGANIZATION   3   0   0   3

OBJECTIVES:

The objective of the course is to help students to:

- Identify the historical development of computer science and technologies and their applications
- Provide functional knowledge of working of computers with it score components.
- Understand how computer represent and manipulate different data typesand how to communicate with peripheral devices.
- Distinguish different number systems and its conversion.
- Provide the knowledge of computer memory andmemory organization.
- Provide in-depth knowledge on basic gates,
- Understand constructions and operation of computer networks, applications of networks, Internet and security.

MODULE I   GENERAL FEATURESOFACOMPUTER   9

General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

MODULE II   COMPUTER ORGANIZATION   9

Computer organization, central processing unit, computer memory – primary memory and secondary memory, Secondary storage devices – Magnetic and optical media, Input and output units, DMA, Hit/Miss ratio, OMR, OCR, MICR, scanner, mouse, modem.

MODULE III   COMPUTERHARDWAREANDSOFTWARE   9

Computer hardware and software, Computer arithmetic, Binary, octal and hexadecimal number systems, Algorithm and flowcharts, illustrations, elements of a database and its applications, Basic Gates (Demorgans theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.

MODULE IV COMPUTER LANGUAGES AND SOFTWARE PACKAGES 9

Introduction of Computer Languages, Machine language and high level language, Application software, computer program, operating system, Computer virus, antivirus and computer security, Elements of MS DOS and Windows OS, An overview of MSWORD, MSEXCEL And MSPOWERPOINT.

MODULE V INTRODUCTIONTONETWORKING   9

Network of computers, Types of networks, LAN, Intranet and Internet, Internet applications, World Wide Web, E-mail, browsing and searching, search engines, multimedia applications

TOTAL HOURS – 45

TEXT BOOK:

1- Rajaraman V. And NeeharikaAdabala "Fundamentals of Computers "6thEdition, from BBT books, NewDelhi2017

2- Michael D. Ciletti, Morris Mano M. "Digital Design: With an Introduction tothe Verilog HDL, VHDL, and System Verilog" (6thEdition),I2017

REFERENCE BOOKS:

1. CharlesH.Roth,Jr.,Kinney,"FundamentalsofLogicDesign",Brooks Publications, Seventh Edition, 2013

2. E Balagurusamy "Fundamental of Computing and programming" 2ndedition, Tata McGraw-Hill, 2012

3. P.K. Sinha "Computer Fundamentals" BPB Publications; ReprintEdition2018

4. Hamacher "Computer Organization" McGrawHillEducation,2011

OUTCOMES:

At the end of the course students will be able to

- Discuss the general features of computer and applicationsofcomputer
- Explain the concept of computer memory and internal working of memory management and various modes ofdatatransfer.
- Illustrate binary, octal number and hexadecimal numbers and their arithmetic and also understand how logic circuits and Boolean algebra forms the basis of digital computer
- Compile the computer high- level languages and applicationsoftwarepackages.

CAC1103	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to:

- Provide introduction to several high level languages and frameworks, the development of procedural codes is important in several commercial app developments.
- Provide object oriented platforms and event driven systems which uses procedural languages for coding integralcommandcontent.
- Develop skill to programs using the UNIXoperatingsystem.
- Provide knowledge about UNIX operating system, C compiler and all UNIX application programs written in C.

MODULE I   OVERVIEWOFPROGRAMMING   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   FUNDAMENTALSOFCPROGRAMMING   9

Overview of C, Data Types, Constants & Variables, Operators & Expressions, Control structures - if then, for, while, Arrays- single & multidimensional arrays, Functions- fundamentals – general form, function arguments, return value, Basic I/O- formatted and Unformatted I/O, Advanced features- Type modifiers and storage class specifiers for data types, Bit operators, ?operator, &operator, * operator, Type casting, type conversion.

MODULE III   ADVANCEDPROGRAMMINGTECHNIQUES   9

Control constructs- Do while, Switch statement, break and continue, exit() function, go to and label, Scope rules- Local & global variables, scope rules of functions, Functions- parameter passing, call by value and call by reference, calling functions with arrays, argc and Control constructs- Do while, Switch statement, break and continue, exit() function, go to and label, Scope rules- Local & global variables, scope rules of functions, Functions-parameter passing, call by value and call by reference, calling functions with arrays, argc and argv, recursion- basic concepts, ex-towersofHanoi.

MODULE IV   DYNAMICDATASTRUCTURESINC   9

Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, mallocvscalloc, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions, function retuning pointers, Structures- Basics, declaring, 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   ADDITIONALFEATURES   9

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

TOTAL HOURS – 45

TEXT BOOKS:

1. Let us C byYashwantKanetka, 6thEdition, PBP Publication, 1999

REFERENCES:

1. The C programming Language by Richie and Kenninghan, BPBPublication,2004

2. Programming in ANSI C by Balaguruswamy, 3rdEdition, Tata McGraw Hill,2005

OUTCOMES:

At the end of the course students will be able to

- Discuss about algorithm design and implementation.
- Write and Execute programs using C Language.
- Develop procedural codes in several commercial application developments.
- Analyze the pointer declaration & addressing of variables
- Develop simple and complex applications using C.

CAC1107   **OPERATING SYSTEMS AND INTRODUCTION**   **L   T   P   C**
                                    TO LINUX   **3   0   0   3**

OBJECTIVES:

The objective of the course is to help students to:

- Learn fundamental concepts in the operating system.
- Understand the concepts of process management and deadlocks.
- Develop skills in memory management.
- Understand different file system and security management.
- Gain knowledge in Linux operating system.

MODULE I   INTRODUCTION TO OPERATING SYSTEMAND THREADS   9

Objectives and Functions of OS, OS Structures, OS Components, OS Services, System calls, Process: Process concept, Process scheduling, Co-operating processes, Introduction to Threads, Single and Multi-threaded processes

MODULE II PROCESSMANAGEMENTANDDEADLOCKS   9

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms. Process Synchronization: Mutual Exclusion, Critical – section problem, Semaphores, Critical Regions, Monitors. Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

MODULE III MEMORYMANANAGEMENT   9

Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Memory Management: Demand paging, Process creation, Page Replacement Algorithms, Thrashing.

MODULE IV FILE SYSTEM ANDSECURITYMANAGEMENT   9

File-System Interface: File concept, Access Methods, Directory structure, File system implementation: File structure, Allocation Methods, Free-space Management, and Recovery. Disk Management: Disk Structure, Disk Scheduling, Swap-Space Management, Disk Attachment, stable-storage Implementation. Security: Security Problem, User Authentication, One – Time Password, Program Threats, System Threats.

MODULE V INTRODUCTIONTOLINUX   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

TOTAL HOURS – 45

TEXT BOOKS:

1. Operating System by Silberschatz / Galvin / Gagne, 6thEdition, Wiley publication,
2. Beginning Ubuntu Linux, Keir Thomas , Andy Channelle and Jaime Sicam,4thedition, 2009

REFERENCES:

1. Operating System by William Stallings, 4th Edition,PearsonEducation,2012
2. Operating System by H.M.Deitel , 2ndEdition,PearsonEducation,2002
3. Operating System by Abraham Silberschatz and peter Baer Galvin, 8thEdition, PearsonEducation,1989
4. Operating Systems by Nutt, 3/e PearsonEducation2004

OUTCOMES:

At the end of the course students will be able to

- Explain the fundamental concepts in Operating system including how OShas evolved over the years and different componentsofOS.
- Discuss Process management and analyze the different CPUscheduling algorithms
- Use appropriate schemes for providingprocess synchronization.
- Illustrate how the deadlock can be managed/avoided.
- Discuss storage andmemorymanagement.
- Explain the concepts of file anddisk management

CAC1109   **PROGRAMMING IN C LABORATORY**   L   T   P   C
   0   0   4   2

OBJECTIVES:

The objective of the course is to help students to:

- Provide programming skill inclanguage.
- Develop programs using control structuresandfunctions,
- Develop programs using different data typesandarrays.
- Develop programs the dynamics of memory by the useofpointers.
- Develop programs using unionsandstructures.
- Create programs using files.

LIST OF PROGRAMS

1. 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 capableofgrazing.

2. 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.
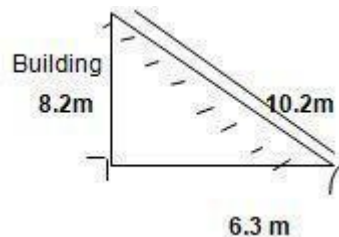
3. Write a C program to find whether a given number is Odd or Even. Also if entered number is even, print half of that number and if odd, print double the number as output.

4. Rahul's birthday falls on 28thFebruary 1994. Write a C program to check if given year is a leap yearornot.

5. Heights of two classmates Priya and Lavanya are 163 cm and 171 cm respectively. Write a C program to find the person who is shorter among the two.

6. A patient is suffering from high fever with 104.2 F. Write a C program to find his body temperatureinCelsius.

7. Write a C program to find Odd & Even numbers innseries.

8. 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. Write a C program to display the newlychangedpassword.

9. Write a C program to display a series such that the sum of two consecutive numbers equals the next number in series. Let the first two numbers be 0and1.

10. Write a C program to find the biggest ofthreenumbers.

11. Write a C program to find sum and average of first99numbers.

12. Write a C program to multiply consecutive numbers in series beginning from 1 till any n valueasinput.

13. Write a C program to find the sum of digits in a debitcard'scvvnumber.

14. 5 passengers travelling to Bangalore have booked tickets in bus. The names of those members are Ajay, Pooja, Rohan, Arun and Sukanya and their respective age are 23,21,19,25 and 30.Write a C program to display these data using an array.

15. RainfallreceivedinfewareasinChennaiwererecordedas31cm,11.64cm, 16.87 cm, 28 cm and 23.5 cm. Write a C program to calculate total amount of rainfall and average rainfall received that day.

16. A health survey was conducted to record the weights of students inaclass.

17. Six among them had weights above 70 kg and they were recorded as 74 kg, 87kg, 79kg, 71 kg, 85 kg and 93kg. Write a C program to find the greatest weight usingan array.

18. Consider an array in following order: 58, 51, 35, 78, 15, 22 and 85. Write a C program to search thevalue35.

19. 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 ordescending order.

20. Consider the CAT 1 exam marks of 5 subjects for 5 students. Similarly CAT 2 exam marks as 2^{nd}matrix. Write a C program to find the total marks obtained in CAT1 and CAT2 by those5students.

21. Ayisha has 5 five stars and 4 kitkats. Ashwin has 10 five stars and 3 kitkats. Both of them ate 2 five stars and 2 kitkats each. Write a C program to find the remaining chocolates leftusingmatrix.

22. The quantity of stationary sold for 3 days are shown.Write a C program to findthe product of the quantity of items mentioned below in the form

ofmatrix.

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

23. A faculty entered marks of 6 students for 6 subjects in form of matrix. Later she realized that the order was incorrect (the rows and columns were interchanged).Write a C program to find the correct matrix ofmarks.

24. Write a C program to find factorial of a given numberusingRecursion.

25. Consider an array in following order: 25, 33, 53, 65, 83, 87 and 92. Write a C program to search thevalue83.

26. Write a C program to check if a given string is read the same both from the beginning as well as whenread backwards.

27. Write a C program to store and display the student mark details for 3 students including name, department,subjects and respective marksusingStructure.

28. Write a C program to input details(name, department,salary) for 3 employeesinto 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 realtimedomain.

TOTAL HOURS – 60

TEXT BOOKS:

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

REFERENCES:

1. Programming in C , PradipDey, Manas Ghosh, 2nd edition OxfordUniversity Press,2013

2. Programming in ANSI C, E.Balaguruswamy, 5th Edition,McGraw-Hill,2010.

OUTCOMES:

At the end of the course students will be able to

- Write, compile and debug programs in C language
- Apply and use different data types in a computer program
- Write programs using structures, loops and functions.
- Demonstrate applications using different data structures
- Handle different operations on files.

CAC 1110   **LINUX LABORATORY**   **L   T   P   C**

                                         0   0   4   2

OBJECTIVES:

The objective of the course is to help students to:

- Execute the basic commands ofUNIX.
- Understand the functionality and modes ofVIEditor.
- Implement the conceptsofUNIX.
- Create shell programinUNIX.
- Develop simple to complexprogramsinUNIX.

LIST OF PROGRAMS

1. Execute 25 basic commands of UNIX.
2. Basics of functionality and modes ofVIEditor.
3. Create a file called vegetables and add the contentsas 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 fileonscreen
   b) Concatenate vegetables and fruits file and displaythe result
   c) Show the difference between fruitsandVegetables
   d) Add the content in the Fruits file asMango,Grape

4. Create a directorycalledfoods
   a) Move vegetables and fruits tofoods directory
   b) Remove vegetables filesfrom foods
   c) Comes outfromfoods
   d) List all the files fromthisdirectory
   e) Display all hidden files fromthedirectory

5. Display the detailed result forthebelow

    a) Get manual help and display the detailed informationabout bash

    b) Display the time to be taken for executingafile

    c) Change the mode of a fruits file to Read only toallusers

    d) Count the number of words invegetables file.

    e) Count the Number of Characters inFruits file.

6. Create a file called mark list and add thefollowing data

SNo	Name	Subject	Marks
1.	ABCD	Physics	100
2.	XYZ	Chemistry	90
3.	MNO	Biology	88
4.	EFG	Computer	88

    a)   Print the 3rd and 4th column on thescreen alone

    b)   Print a row which has'r'character

    c)   Printallcolumns

    d)   Search Computer from the marklistfile

    e)   Replace 'i' to 'x' in thefilemark list

    f)   Remove a marklist fromthedirectory

7. Create a file in vi editor and do thefollowing

    a) Type 1-10 numbers and repeat it for two timesusingmacros

    b) Find the current working directory insidevieditor

    c) Open twofiles horizontally

    d) Addline numbers

    e) Splitthewindow

    f) Search all the occurrences of thewordTEXT

8. Create a file in vi editor and do thefollowing

    a) Insert a line in the beginning and endofline

    b) Yank the last line of the text and paste asfirstline.

    c) List all the files with detailed information from this directory insidevi editor

    d) Change all the occurrences of the word TEXT to UNIX Swap first andsecond paragraph.

9. Disk related commands and communication commandsinUnix

    a) Find the disk used space in yourdirectory.

    b) Find disk free space in your directorywithoptions.

    c) Send message to all users,"ToshutdowntheSystem"

d) Block other user from writing inyour terminal

e) Find thedisk usage

10. Write a shell program to print all odd numbers between10-30.

TOTAL HOURS –60

TEXT BOOKS / 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,4thedition, 2009

OUTCOMES:

At the completion of this course students will be able to

- Implement basic commands of UNIX
- Develop skills on the concepts of UNIX.
- Create shell program in UNIX.
- Develop simple and complex programs in Linux.
- Implement GNU tool chain with Eclipse IDE.

SEMESTER II

ENC 1284	GENERALENGLISH - II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To expose students to English literary texts.
- To help them interpret literary texts.
- To exhibit the effective use of the four skills ofcommunication.
- To demonstrate the range of vocabulary and communicateeffectively using grammaticallycorrect language.

MODULE I   **8**

Prose   Qahwah

Poem   William Wordsworth –"Nutting" Letter to Editor

ShortStory   G.K. Chesterton – The Hammer of God (ExtensiveReading)Language Focus-- Modals & AuxiliaryVerbs

MODULE II   **7**

Prose   Environment

Poetry   John Keats – "La Belle DameSansMerci"

Short Story   Katherine Mansfield—A Cup of Tea (Extensive Reading) Dialogue WritingLanguageFocusIf Clauses

MODULE III   **8**

Prose   A Dilemma

Poetry   Robert Frost–"Design"

Short Story   Thomas Wolfe—The Far and the Near (Extensive Reading) ConversationsLanguageFocusQuestionTags

MODULE IV   **7**

Prose   Computeracy

Poetry   Sarojini Naidu –"The Gift of India"

Short Story   R.K. Narayan – "Half a Rupee Worth"(ExtensiveReading) LanguageFocus'Wh' &Yes/NoQuestions

MODULE V   **7**

Prose   War Minus Shooting

Poetry   Nissim Ezekiel – "The Night of the Scorpion" ReportWritingLanguageFocusDirectto Indirect

MODULE VI   **8**

Poetry   Mathew Arnold–Dover Beach

Short Story   Ruskin Bond – "The Boy Who Broke the Bank" (Extensive Reading) Language Focus—Common Errors

TOTAL HOURS – 45

REFERENCES:

1. Krishnaswamy. N, Sriraman T. Current English for Colleges. Hyderabad:Macmillan Indian Ltd, 2006.
2. Dahiya SPS. Ed. Vision in Verse- An Anthology of Poems. New Delhi: Oxford UniversityPress,2002.
3. Swan,M.(2005). Practical English Usage. OxfordUniversityPress.UK
4. Seshadri, K G Ed. Stories for Colleges. Chennai: Macmillan IndiaLtd,2003.

OUTCOMES:

After completing the course the students would be able to

- Respond to literary texts efficiently.
- Appreciate and critically analyzeliterary texts.
- Use the four skills ofthe language
- Use vocabulary and grammaticalexpressions effectively

MAC1288   **PROBABILITYANDSTATISTICS**   **L**   **T**   **P**   **C**

                                                           3   **1**   **0**   **4**

OBJECTIVES:

The objective of the course is to help students to:

- Impart knowledge about the basic concepts of probability in solvingapplication oriented problems
- Provide an understanding on the conceptsof statistics

RECAPINTRODUCTIONTOPROBABILITY   **4**

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

MODULE I   RANDOMVARIABLESANDDISTRIBUTIONFUNCTIONS   **13**

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 II   MOMENTS ANDMOMENTGENERATINGFUNCTIONS   **11**

Expectation of a random variable – probability generating function – properties – momentgenerating function.

MODULE III TWO DIMENSIONALRANDOMVARIABLES   **9**

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

MODULE IVDESCRIPTIVE STATISTICS   **10**

Types of data - primary and secondary data - classification and representation of data - formation of frequency distribution - various measures of central tendency, dispersion - and their merits and demerits - concept of skewness and kurtosis.

MODULE V   CORRELATIONANDCURVE FITTING   **12**

Correlation coefficient and regression - rank correlation - curve fitting by least square methods - fitting a straight line, parabola, power curve and exponential curves. (no derivation, numerical problems only)

TOTAL HOURS – 60

TEXT BOOKS:

1. RichardArnoldJohnson,IrwinMiller,JohnE.Freund,Miller &Freund's,Probability and Statistics for Engineers, PrenticeHall,2011.
2. Dr. P. Kandaswamy, Dr. K. Thilagavathy and Dr. K. Gunavathy, Probabilityand Queuing Theory, Revised edition, S. ChandPublishing,2013.
3. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill, 2nd edition.

REFERENCES:

1. Goon, A.M., M. K. Gupta and B. Das Gupta Fundamentals of Statistics-Vol. I, World Press Ltd,Kolkata,2002.
2. Gupta, S.C. and V.K. Kapoor, Fundamentals of Mathematical Statistics,Sultan Chand & Sons, NewDelhi,2002.
3. Hogg, R.V. and A. Craig, Introduction to Mathematical Statistics, McMillan Publishing co.,Inc.1978.
4. Mood A.M., F.A. Graybill and D.C. Boes, Introduction to Theory ofStatistics McGraw Hill BookCo.,1974.
5. Sheldon M. Ross, Introduction to Probability and Statistics for Engineersand Scientists, FourthEdition,Elsevier.

OUTCOMES:

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

- Solve basic problems in probability and fundamentalsofstatistics.
- Solve problems using standardprobability distributions.
- Find the marginal and conditional distributions of two dimensionalrandom variables.
- Calculate rank correlation and fitting curves for the given data.
- Use method of moments and moment generating functions.

CAC1203	OOPSWITHC++	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to:

- The basic concept and techniques which form the object orientedprogramming paradigm.
- Way of thinking about problem using models organized around realworld concept.
- The concepts ofoperator overloading
- The concepts of defining data members and member functions inaclass

MODULE I   INTRODUCTION   9

Evolution of programming methodologies-Procedure oriented versus Object Oriented Programming-characteristics of OOP, Basics of OOP, Merits and Demerits of OOP. Data Types: Different data types, operators and expressions in C++, Keywords in C++. Input and Output: Comparison of stdio.h and iostream.h, cin and cout. Decision and loop: Conditional statement - if-else statement, nested if-else statement, switch, break, continue, and goto statements, Looping statements- for loop, while loop, Do-while loop. Arrays, String and Structures : fundamentals-Single dimensional, multi-dimensional arrays, fundamentals of strings, different methods to accept strings, different string manipulations, array of strings, Basics of structures-declaring and defining structure- Accessing structure members, array of structures, Unions difference between structures and Unions, Enumerated data types-declaration andtheir usage.

MODULE II   CLASS   9

Class: Definition-defining the class, defining data members and member functions, Access specifier-private, public, protected, objects as function arguments,returning objects from the function, scope resolution operator, and member function defined outside the class, difference between class and structure, array as class member data, Array of objects. Functions in C++ : Function definition, function declaration, Built-in functions, user defined functions, calling the function, passing parameter-actual and formal, different methods of calling the function call by value, call by reference using reference as parameter and pointer as parameter, overload function-different types of arguments-different number of arguments, inline function, default argument, storage classes-automatic, external, static, register. Constructor and Destructor: Constructors-constructor with argument, constructor without arguments,

constructor with default arguments, Dynamic constructor, constructor overloading, copy constructor, destructors, Manipulating private data members.

MODULE III   OPERATOROVERLOADING   9

Operator overloading: Defining operator overloading, overloading unary operator,overloading binary operator, manipulation of string using overloaded operator, rules for overloading operator.Data conversion: conversion between Basic types, conversion between objects & Basic types, conversion between objects of different classes. Inheritance: Base Class & derived class, defining derived classes, protected access specifier, public inheritance and private inheritance-member accessibility, constructors and destructors in derived classes, Level of inheritance-single inheritance, multiple inheritance, multi-level inheritance, hierarchical inheritance, hybrid inheritance.

MODULE IV   POINTER   9

Pointer: Pointer declaration and Access, Pointer to void, pointer and arrays, pointer constant and pointer variable, pointer and functions, pointer, call by pointer arrays, array of pointers to string, printer sort, memory management-new and delete, pointer to object-referencing members using pointers, self-containing class, this pointer, returning values using this pointer. Virtual function: Normal member functions accessed with pointers, virtual member function access, late binding, pure virtual function, abstract class, virtual base class. Friend functions and static function:Purpose,definingfriend functions, friend classes, static function, accessing static function numbering positive objects.

MODULE V   TEMPLATESANDEXCEPTIONHANDLING   9

Templates and Exception Handling: Introduction to templates, class templates, function templates, Member function templates, Template arguments, Exception handling. Console IO Operator:C++ stream and C++ stream classes, unformatted I/O operators, formatted I/O operators-manipulators-user defined manipulators. Files: Class for file stream operators, opening and closing a file, file nodes, writing an object to disk, reading an object from disk, binary versus character files, I/O with multiple object, stream class, file pointer-specifying the position,

TOTAL HOURS – 45

TEXT BOOKS:

1. E. Balaguruswamy: Object Oriented Programming with C++, Tata McGrawHill. Publications ,6[th]edition2013

2. Stroustrup: The C++ Programming Language, Pearson Edition,3rdEdition

3. LaforeRobert:ObjectOrientedProgramminginTurboC++,GalgotiaPublicatio ns,4thedition

REFERENCES:

1. Lippman: C++ Primer, 3/ePearsonEducation
2. C++ completer reference by Herbert Schildt, Tata McGrawHillPublications.
3. Let us C++byYeshwanthKanetkar

OUTCOMES:

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

- Describe the Merits and Demerits of OOP.
- Implement the concepts of arrays, strings &structure in the applications
- Analyze the pointer declaration & addressing of variables
- Write programs using inheritance and polymorphism
- Develop the template and exception handling programs

CAC 1204	DATASTRUCTURESUSINGC	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to:

- Storing and organizing data in a computer so that it can beused efficiently.
- Different kinds of data structures suited to different kinds ofapplications and
- The basic concepts of different data structures which are the basicbuilding blocks of programming andproblem solving.

MODULE I   **INTRODUCTIONTODATASTRUCTURES**   **9**

Definition, Classification of data structures: primitive and non primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs – Binomial coefficient,Fibonacci,GCD.

MODULE II   **SEARCHINGANDSORTING**   **9**

Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort

MODULE III   **STACKANDQUEUE**   **9**

Stack – Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix,Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue , Operations on all types of Queues

MODULE IV   **LINKEDLIST**   **9**

Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

MODULE V   TREEGRAPHS ANDTHEIRAPPLICATIONS   9

Definition: Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth First search, Breadth First search.

TOTAL HOURS – 45

TEXTBOOKS:

1. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education,2001
2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill, 1st edition (1July2017)
3. Robert Kruse, Data Structures and program designing using 'C',3rdedition,2007

REFERENCES:

1. Bandyopadhyay, Data Structures Using C Pearson Education,1999
2. Tenenbaum, Data Structures Using C. Pearson Education, 2ndedition2015
3. Kamthane: Introduction to Data Structures in C. PearsonEducation2005.
4. Hanumanthappa M., Practical approach to Data Structures, LaxmiPublications, Fire Wallmedia2006

OUTCOMES:

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

- Examine a given problem and recommend suitable data structure.
- Implement operations on arrays, linked lists, stacks and queues.
- Design, implement, test, and debug programs using a variety of data structures including binary and general tree structures.
- Compare different data structures and pick up an appropriate data structure for a given design situation.
- Employ Algorithm for solving problems like sorting and searching .

CAC1256   ENVIRONMENTALSTUDIES

	L	T	P	C
	2	0	0	2

OBJECTIVES:

The objective of the course is to help students to:

- Various natural resources, availability, utilization and itscurrent scenario.
- Different ecosystems,energy transfer.
- Values, threats and conservationof biodiversity.
- Levels of different pollutants and its impact and the causes and effectsof natural disasters

MODULE I   NATURAL RESOURCES   8

Land resources: land degradation, soil erosion and desertification - Forest resources: use and over-exploitation, deforestation - Water resources: use and over-utilisation of surface and ground water, water conservation (rainwater harvesting and watershed management) - Food resources: world food problems, changes in land use by agriculture and overgrazing, modern agriculture and its effects - Energy resources: increasing energy needs, renewable and non-renewable, use of alternate energy sources.

MODULE II   ECOSYSTEM   8

Ecosystem- energy flow in the ecosystem - food chains, food webs and ecological pyramids - characteristics, structure and function of (a) Terrestrial ecosystems (forest, grassland, desert) and (b) Aquatic fresh water ecosystems (pond, lake, river) (c) Aquatic salt water ecosystems (ocean, estuary) -ecological succession.

MODULE III   BIODIVERSITYANDITS CONSERVATION   8

Biodiversity - genetic, species and ecosystem diversity – hot-spots of biodiversity – bio geographic classification of India - endangered, endemic, extinct and invasive species of India - red data book - values of biodiversity: consumptive, productive, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

MODULE IV ENVIRONMENTAL POLLUTION AND

NATURAL DISASTER   6

Definition, cause, effects and control measures of (a) air pollution (b) water

pollution.soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazardsill-effects of fireworks and upkeep of clean environment - solid waste management: types (urban, industrial, biomedical and electronic wastes), collection, processing and disposal (incineration, composting and land-fill).Natural disaster and management: flood, cyclone, drought, landslide, earthquake and tsunami.Case studies related to currentsituation.

TOTAL HOURS – 30

TEXT BOOKS:

1. ErachBharucha, Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education for University Grants Commission, Orient BlackswanPvt Ltd, Hyderabad,India,2013.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill Education, India, 2009.
3. Ravikrishnan A, Environmental Science and Engineering, Sri Krishna Publications, Tamil Nadu,India,2015.
4. RamanSivakumar,IntroductiontoEnvironmentalScienceand Engineering,McGraw Hill Education,India,2009.

REFERENCE BOOKS:

1. Masters G.M. and Wendell P., Introduction to Environmental Engineeringand Science, 3rd Edition, Prentice Hall, NewDelhi,2007.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. Boston,USA, 2016.

OUTCOMES:

At the end of the course the student will be able to

- Predict the scenario of various natural resources and suggest remedies tocurb the exploitation of these resources.
- Identify food chain and web and its role invarious ecosystems.
- Assess the impacts on biodiversity and provide solutions toconserve it.
- Analyze the impacts of pollutants in the environment and proposesuitable method to alleviate the pollutants and thenatural disasters.

CAC1208	OOPS WITHC++-LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

The objective of the course is to help students to:

- Understand and solve logical & mathematical problems throughC++language

- Strengthen knowledge of a proceduralprogramming language.

- Design and develop solutions to intermediatelevel problems

- Develop their skills in software development using aprocedural language

- Get programming in skill the object oriented technology with the usageofC++.

LIST OF PROGRAMS

1. Number of vowels and number of characters inastring.

2. Write a function called zerosmaller () that is passed with two introducearguments by reference and set the smaller of the number to zero. Write a man() program to accessthisfunction.

3. Demonstration of arrayofobject.

4. Using this pointer to return a value (returnbyreference).

5. Pointersort.

6. Demonstration ofvirtual function.

7. Demonstration ofstatic function.

8. Accessing a particular record in astudent'sfile.

9. Using different methods to write programs to implement functionoverloading.

10. Default arguments for the followingproblems:

     a)   To find whether a given numberis prime.

     b)   To find the factorial ofanumber

11. Write a program to create a database for a bank account contains Name, Account no, Account type, Balance, Including the following a) Constructors b) destructors call) default constructors d) input and output function; input and output for 10 people using differentmethods.

12. Create a class to hold information of a husband and another for the wife. Using friend functions give the total salary of thefamily.

13. Write a program to overload the following operators(any3)

      a)   Binary operator '+' to concatenate2string

      b)   Relational operator '<' to find whether one data is less than theother

      c)   Unary operator '++' to find the next date of a givendate.

14. 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) stackunderflow.

15. Create a database using concepts of files for a student including 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.

16. Using operator overloading concept implement arithmetic manipulation on two complexnumbers.

17. Create a scenario based on real timedomain.

TOTAL HOURS –60

REFERENCES:

1. E.Balaguruswamy: Object Oriented Programming with C++, Tata McGraw Hill. Publications ,6th edition 2013.

2. Stroustrup: The C++ Programming Language, Pearson Edition, 3rd Edition 2010.

OUTCOMES:

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

- Implement inheritance, polymorphism and object relationship inC++
- Design methods andprocedure
- Manipulate data through file inC++
- Debug and testsoftware.
- Develop a minor software in C++language

CAC1209   DATA STRUCTURES USINGC–LABORATORY   L   T   P   C

0   0   4   2

OBJECTIVES:

The objective of the course is to help students to:

- Understand the implementation of recursive functions andstrings.
- Introduce the implementation of linked list and the variousoperations.
- Implement stack and queue using dynamic memory allocation.
- Introduce the Binary Search Tree implementation usingC.
- Learn to implement various sorting and searchingalgorithms.

LIST OF PROGRAM

1. Given with two numbers 36 and 60, write recursive function using C to find GCD of two numbers.
2. Write a recursive function using C program to display a series such that the sum of two consecutive numbers equals the next number in series. Let the first two numbers be 0 and 1.
3. Use a recursive function for the towers of Hanoi with threediscs.
4. Two strings "Welcome" and "World" are provided. Write a program using pointers to find the length of a string and to concatenate the twostrings.
5. String1 is stored with "Greater". Write a program using pointers to copy string1 to string2 and to extract "Great"fromstring2.
6. Consider an array in following order: 25, 33, 53, 65, 83, 87 and 92. Write a C program to insert the value 88 andremove65.
7. Write a C Program using dynamic variables and pointers, to construct a singly linked list consisting of the following information n each node: student id (integer), student name (character string) and semester (integer). The operations to be supported are:
   a. The insertionoperation
      i. At the front of alist
      i. At the back of thelist
      ii. At any position in thelist
   b. Deleting a node based on student id. If the specified node is not present in the list an error message should be displayed. Both the options should be demonstrated.
   c. Searching a node based on student id and updating the information content. If the specified node is not present in the list an error

message should be displayed. Both situations should be displayed.

    d. Displaying all the nodes in thelist.

8. The heights of ten students were marked as 163cm, 171 cm, 158 cm, 167cm, 175cm, 160cm, 173 cm, 149 cm, 180cm and 154cm. Find the difference while sorting the given heights in ascending or descending orderusing

    a. Insertion sort

    b. SelectionSort

    c. MergeSort

9. Write a C program to implement the following operationsinstacks:

    a. Push

    b. Pop

    c. Display

10. Write a C program to implement the following operations in queue: Insert, Delete, Display

11. Create a binary search tree and traversing it using in order,pre orderand post order.

12. Create a scenario based on real timedomain.

TOTAL HOURS –60

TEXTBOOKS:

1. Magnifying Data Structures, Aprita Gopal, First Edition ,Prentice Hall India Learning PrivateLimited(2010)

2. Data Structures in C, Horowitz, Sahni, Anderson-Freed, Universities Press, Secondedition(2008)

3. NarasimhaKarumanchi,"DataStructuresandAlgorithmsMade Easy: Career Monk Publications; Fifth edition,2016.

4. Structure and Algorithmic Puzzles", 2nd Edition, Create SpaceIndependent PublishingPlatform,2011.

REFERENCES:

1. Ashok N. Kamthane, "Introduction to Data Structures in C", 2nd Edition,Wiley Publications,2008.

2. DataStructures Using C - A.S.Tanenbaum, Y. Langsam, and M.J.Augenstein, Pearson Education India; 2[nd]edition,2015.

OUTCOMES:

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

- Write and demonstrate recursivemethods
- Implement stack and queue and evaluate various operations involvedinit
- Implement and execute circular queue using array
- Develop an application using singly linked list and doubly linkedlist
- Implement and analyze various searching techniques and sorting techniques

SEMESTER III

CAC2101   REASONING ANDTHINKING   L   T   P   C
                                                3   0   0   3

OBJECTIVES:

The objective of this course is to let the students

- Understand the concepts of Reasoning and thinking.
- Learn to take the right decisions, approach every problem with diligence and perform action accordingly.
- Understand the key mathematical concepts
- Apply the concepts learned to solve critical problems

MODULE I   VERBAL ABILITY   9

Synonyms, Antonyms and one word substitutes

MODULE II   BASICQUANTITATIVEAPTITUDE   9

Speed, Time and Distance, Time and Work, Linear Equations, Progressions (Sequences & Series), Permutation and Combination, Probability, Functions, Set Theory, Number Systems, LCM and HCF, Percentages, Collection and Scrutiny of data: Primary data, questionnaire and schedule; secondary data, their major sources including some governmentpublications

MODULE III   LOGICALREASONING   9

Number and Letter Series, Calendars, Clocks, Cubes, Venn Diagrams, Binary Logic, Seating Arrangement, Logical Sequence, Logical Matching, Logical Connectives, Syllogism.Blood Relations; concept of a statistical population and sample from a population; qualitative and quantitative data.

MODULE IV MEASURESOFCENTRALTENDENCY   9

Objective of averaging, characteristics of good average, types of average, arithmetic mean of grouped and ungrouped data, correcting incorrect values, weighted arithmetic mean- Median - median of grouped and ungrouped data merit and limitation of median, computation of quartile, decile and percentile Mode - calculation of mode of grouped and ungrouped data, merits and limitation of mode, relationship between mean, median and mode. Geometric mean and Harmonicmean.

MODULE V   **PRESENTATIONOFDATA**   **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 – Introduction and approach

TOTAL HOURS =45

TEXT BOOKS:

1. Bajpai, N. Business Statistics,Pearson,2010
2. Sharma J.K., Business Statistics, Pearson EducationIndia,2010.
3. Richard I Levin, David S. Rubin: Statistics for Management, PearsonPrenticeHall Education Inc. Ltd, NewDelhi,5thEd.2010

REFERENCES:

1. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams, Quantitative Methods for Business, Prentice-Hall, WestPublishingCompany,1996.
2. CAT Complete course,UPKARpublications

OUTCOMES:

At the end of this course, the students will be ableto:

- Acquire knowledge on the representation and reasoning techniques.
- Illustrate thinking as a computational problem.
- Model the way mind works as an information processor.
- Illustrate the way in which knowledge is represented.
- Acquire knowledge in aptitude and in logical reasoning.

CAC2103   **SOFTWARE ENGINEERING**   **L   T   P   C**

                                                                              3   0   0   3

OBJECTIVES:

The objective of this course is to let the students:

- Understand the basic software engineering methods andpractices
- Learn about the concepts of software products and softwareprocesses
- Understand the importance of SRS in softwaredevelopment
- Learn the need and importance of softwaretesting.

MODULE I   INTRODUCTION   9

Definition of software and software engineering – Software myths –Software Engineering paradigms: Linear Sequential Model & Prototyping Model Software Project Management – Software Metrics – Software Cost Estimation – Software Project Planning.

MODULE II   SOFTWAREREQUIREMENTANALYSIS   9

Software Risks – Software Configuration Management System Analysis – Modeling the System Architecture – System Specification –Fundamentals of Requirement Analysis – Software Prototyping – Prototyping methods and tools specification – Software requirements Specifications

MODULE III   STRUCTURED ANALYSIS   9

Introduction – the elements of the analysis model – data objects, attributes and relationships – Cardinality and Modality – ERD – DFD – Classical Analysis Methods : DSSD, JSD, SADT.

MODULE IV   SOFTWAREDESIGN   9

Software Design and Software Engineering – Design and Software Quality – Evolution of Software Design – Design Principles. Design Concepts, Abstraction, Refinement, Modularity – Effective Modular Design, Functional Independence,Cohesion,Coupling.

MODULE V   SOFTWARETESTING METHODS   9

Software Testing Fundamentals – White Box Testing – Black Box Testing – Debugging– Software Quality: McCall's Quality Factors

TOTAL HOURS – 45

TEXT BOOKS:

1. Stephen Withal, "Software Requirement Patterns", 3rd Edition, Microsoft Press, 2011.

REFERENCES:

1. Karl& Joy Beatty," Software Requirements", 3rd Edition, Microsoft Press, 2012.
2. S.K.Kataria, Rajiv Chopra, "Object Oriented Software Engineering",3rd Edition,2013.

OUTCOMES:

At the completion of this course students will be able to

- Choose the appropriate process model for the software application to be developed.
- Collect requirements based on the type of the application and its need.
- Acquire knowledge on the structured analysis tools..
- Modify and improve the software product based on user needs and performance.
- Apply the appropriate testing strategies to the developed products.

	L	T	P	C
CAC2104 **RDBMS**	3	0	0	3

OBJECTIVES:

The objective of this course is to let the students

- Learn about the purpose of databasesystems.
- Understand the fundamentals of relational systems including datamodels, database architectures, and databasemanipulations.
- Obtain knowledge about relational databasemodel.
- Learn the basic concepts of databases in general with an emphasis on relational databases, modeling techniques and writingqueries.
- Understand Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

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) – E-R Diagrams -- Introduction to relationaldatabases

MODULE II RELATIONAL MODEL 9

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals, Oracle data types, Data Constraints, Column level & table Level Constraints, working with Tables, Defining different constraints on the table, Defining Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator, Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL, Manipulation Data in SQL. Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union, intersect & Minus Clause.

MODULE III SQLVIEWS,INDEXANDTRIGGERS 9

Creating view, Renaming the Column of a view, Granting Permissions, - Updating, Selection, Destroying view Creating Indexes, Creating and managing User, Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL-MissingInformation– Views – Introduction to Distributed Databases and Client/Server Databases

MODULE IV   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 V   TRANSACTIONS   9

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.

TOTAL HOURS – 45

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "DatabaseSystem Concepts", Fifth Edition, TataMcGrawHill,2006
2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of DatabaseSystems", Fourth Edition,Pearson/AddisionWesley.2007
3. Raghu Ramakrishnan, "Database Management Systems", Third Edition,McGraw Hill.2003.

REFERENCES:

1. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management Systems", Springer Science &BusinessMedia.
2. N. P. Singh, C.S. Gupta, "Relational Database Management Systems",Abhishek Publications,15-May-2014

OUTCOMES:

At the completion of this course students will be able to

- Describe fundamental elements of a relational database management system.
- Transform an information model into a relational database schema.
- Demonstrate any database applications using ER diagrams.
- Write complex queries to solve the real world problems.
- Compare the various transaction schedules.

CAC2105   **COMPUTER NETWORKS**   **L   T   P   C**

                                                         3   0   0   3

OBJECTIVES:

The objective of this course is to let the students:

- Understand the underlying Network model and Communicationprinciples.
- Learn about various Switching techniques and Multiplexingapproaches
- Obtain knowledge about how various layerswork
- Learn how High Performance Networkswork

MODULE I   **NETWORKFUNDAMENTALS**   **9**

A communications model - Data Communications - Data Communications Networking - computer communication architecture - standards Data Transmission - Concepts and terminology - Analog and Digital - Transmission - Transmission Impairments - Transmission media.

MODULE II   **PHYSICAL LAYER**   **9**

Data encoding - Digital data Digital signals,Digital data Analog signals, Analog data Analog signals Data Communications Interface: Asynchronous and synchronous Transmission - Line configuration - Interfacing.

MODULE III   **DATALINKLAYER**   **9**

Data link control: Flow controls - Error Detection - Error Control - High Level Data Link Control (HDLC) - MULTIPLEXING - Frequency Division multiplexing - Synchronous timeDivision multiplexing - Statistical timedivisionmultiplexing.

MODULE IV   **NETWORKLAYER**   **9**

Circuit switching: Circuit switching networks switching concepts - Routing in circuit switched networks - Packet switching principles - Routing in packet switching - Congestion control.

MODULE V   **HIGHPERFORMANCENETWORKS**   **9**

Frame relay: Frame relay Protocol Architecture - Frame relay call control user data transfer - Networks functions - Congestion control, ASYNCHRONOUSTRANSFERMODE (ATM) Protocol Architecture – ATM logical connection - ATM Cells – Transmission of ATM cells - ATM adaption layer - Traffic and congestion control.

TOTAL HOURS – 45

TEXT BOOKS:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks: ASystems Approach", 4th Edition,Elsevier,2007.
2. Forouzan: Introduction to Data Communication & Networking, McGraw-Hill, 2007.

REFERENCE:

1. Andrew S. Tanenbaum, "Computer Networks", 4 th Edition, Prentice-Hall of India,2003.
2. James F. Kurose and Keith W. Ross, "Computer Networking: ATop-Down Approach Featuring the Internet", 3rd Edition, PearsonEducation,2006.

OUTCOMES:

At the completion of this course students will be able to

- Examine the various application layer protocols and propose the solutions based on the compare and contrast the OSI reference model and TCP/IP model
- Identify different congestion control techniques and critique upon them.
- Identify the different types of network topologies and protocols.
- Analyze the services and features of the various layers of data networks

CAC2106   PROGRAMMING IN JAVA   L   T   P   C
                                                  3   0   0   3

OBJECTIVES:
The objective of this course is to let the students:
- Write, compile and execute Javaprograms
- Build robust applications using Java's Object OrientedProgramming
- Understand how exception handling works injava
- Read and write data usingJava streams

MODULE I   INTRODUCTIONTOJAVA   9
Brief History of Java, Special Features of Java, Data Type & Operators in Java, Arrays, Objects, the Assignment Statement, Arithmetic Operators, Relational and Logical Operators in Java, control Structures, Constructor, Finalizes, Classes inside classes : composition.

MODULE II   CLASSAND INHERITANCE   9
The Java Class- Inheritance, Deriving Classes, Method Over-riding, Method Overloading, Access Modifiers, Abstract Class and Method, Interfaces, Packages, Imports and Class Path.

MODULE III   THREADS AND EXCEPTIONHANDLING   9
Exception Handling, The Try-Catch Statement, Catching more than one Exception, Generating Exceptions, Threads: Introduction, Creating Threads in Applications-Thread Priority

MODULE IV   INPUTSTREAMCLASSES   9
IO Packages, Java Input Stream Classes, Java Output Stream Classes, File Class.

MODULE V   APPLETSANDAWTPACKAGES   9
Creating an Executable Applet, Applets Life Cycle, AWT and Graphic methods, Fonts, Loading and Viewing Images, Loading and Playing Sound, Event Handling, Layouts

TOTAL HOURS – 45

TEXT BOOKS:

1. Hortsmann& Cornell, "Core Java Advance Features VOL II", 9thEdition,Pearson Education,2013.

REFERENCES:

1. Patrick Naughton, "Complete Reference: JAVA 2", 8th Edition, Tata McGrawHill, 2011.
2. Andrew Lee Rubinger, Bill Burke "Enterprise JavaBeans 3.1", 6thEdition, O'ReillyPublishers,2010.

OUTCOMES:

At the completion of this course students will be able to

- Identify classes, objects, members of a class and relationships among them needed for a specific problem
- Write Java application programs using OOP principles
- Demonstrate the concepts of polymorphism and inheritance
- Write Java programs to implement error handling techniques using exception handling

CAC 2109   **RDBMS LABORATORY**   **L   T   P   C**

                                                                                         0   0   4   2

OBJECTIVES:

The objective of this course is to let the students:

- Understand the need for database
- Write queries to extract data
- Understand how triggerswork

LIST OF PROGRAMS:

1. Create User in Oracle Database and grant and revoke the privileges and use of commit save point rollbackcommand.
2. Create the following:
   - Synonym sequences andIndex
   - Create alter and updateviews.
3. Create PL/SQL program using cursors, control structure,exception handling
4. Create following:
   - SimpleTriggers
   - Package using procedures andfunctions.
5. Create the tablefor
   - COMPANYdatabase
   - STUDENT database and Insert five records for eachattribute.
6. Illustrate the use of SELECT statement
7. Conditional retrieval – WHERE clause
8. Query sorted - ORDER BYclause
9. Performfollowing:
   - UNION, INTERSECTION and MINUS operations ontables.
   - UPDATE, ALTER, DELETE, DROP operations ontables
10. Query multiple tables using JOINoperation.
11. Grouping the result of query - GROUP BY clause and HAVINGclause
12. Query multipletablesusing   NATURAL and OUTER JOINoperation.
13. Create a scenario based on real timedomain

TOTAL HOURS – 60

REFERENCES:

1. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management Systems", Springer Science & Business Media.2013
2. N. P. Singh, C.S. Gupta, "Relational Database Management Systems", Abhishek Publications, 15-May-2014

OUTCOMES:

At the completion of this course students will be able to

- Identify the basic concepts and various data model used in database design
- Design and implement a database schema for a given problem-domain
- Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database

CAC2110	**PROGRAMMING IN JAVA LABORATORY**	L	T	P	C
		0	0	4	2

OBJECTIVES:

The objective of this course is to let the students:

- Develop the programming skills using the object oriented programming methodology to produce quality computer based solutions to real problems.
- Utilize the advance features of Javatechnology.
- Work with collection API and develop fastprograms.
- Develop good multithreaded programs.

LIST OF EXERCISES:

1. Programs using basic data types, operators and controlstructures.
2. Class definitions and usage involving variety of constructors andfinalizes
3. Programs involving various kinds ofinheritances,
4. Program to demonstrate creation and handling of packages, their imports andClassPath.
5. Programs involving a variety of Exception Handlingsituations
6. Program involving creating and handling threads in applications andapplets.
7. Program to demonstrate AWT/Swing graphicmethods
8. Program for Loading and Viewing Images, Loading and PlayingSound
9. Programs to demonstrate variousLayouts
10. Programs to demonstrate event handling

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", TataMcGrawHill 2002.
2. Herbert Schildt, The Complete Reference – Java 2, 4th Edition, Tata McGraw Hill,2007

OUTCOMES:

At the completion of this course students will be able to

- Implement Java classes from specifications
- Effectively create and use objects from predefined class libraries
- Implement   primitive data types   and arrays
- Write programs using interfaces, inheritance, and polymorphism
- Develop programs using Applet.

SEMSTER IV

CAC2216	**INTRODUCTION TO PYTHON**	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Introduce the basic concepts of python programming with values and variables.
- Know the basic arithmetic operators syntax in program.
- Understand the conditional branching of programming flow.
- Understand the function parameters and their passing values.
- Apply the data structures and features in sorting and searching.

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   ARITHMETICEXPRESSION   9

Expression and arithmetic, operator precedence and associatively, comments and errors, syntax errors, run time errors, logic errors, arithmetic operators

MODULE III   CONDITIONSTATEMENTS   9

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 IV   FUNCTIONS   9

Functions, standard mathematics functions, time function, random function, importing function, writing own functions, parameter passing, custom function vs standardfunctions. Global variables, default variables, recursion, reusable functions, functions as data.

MODULE V   LINEARSEARCH   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, Custom types - geometric, handling exceptions

TOTAL HOURS :45

TEXT BOOKS:

1. Learning to Program with Python by Richard L. Halterman.(2011)
2. Guttag, John. Introduction to Computation and Programming UsingPython.Spring 2013 edition.MITPress,2013.

REFERENCES:

1. Programming Python, 4th Edition by Mark Lutz (2010)O'ReillyMedia
2. Python Cookbook, 3rd Edition: Recipes for Mastering Python 3, byDavidBeazley and Brian K. Jones, on O'ReillyAtlas(2013)

OUTCOMES:

After completing this course, students will be able to

- Write code with basic data types and variabledeclarations.
- Perform calculations using arithmeticexpressions.
- Perform control flow with conditional branching inprogram.
- Writes customized and standard function in aprogram.
- Stores data and performs sorting and searching operations

CAC2217	ORGANIZATIONAL BEHAVIOUR	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Enable the students to understand the need of Organizational Behavior In the technicalenvironment.
- Understand the concepts, principles and techniques relating todifferent functional areas of OrganizationalBehavior
- Make the students understand the need for applying the concepts of Organizational behavior to improve the overall systemperformance.

MODULE I   LEADERSHIP   9

Technical Leadership - Leader's Goal, Conviction, Vision – Transformational and Transactional Leadership - Leader's Vision - Professionalism: Importance, Elements - Managing Awareness - Performance - Manager's Role in Professionalism

**MODULE II   MANAGING TECHNICAL AND
               PROFESSIONALPEOPLE   9**

Goals of Engineers and Scientists - Work Assignment - Need for Influence - Professional Career and Goals - Age and Creativity - Performance - Motivation-Employee Partnership - Career Risks - Technical Competence – ProfessionalDiscipline- Manager's Role in Professional Discipline - Guidelines.

**MODULE III   IDENTIFICATION AND DEVELOPMENT OF
               TALENTED PEOPLE   9**

Talented Professionals – Importance - Characterization - Identification –Assessment and Recognizing Talent - Development – DevelopmentNeeds-Counseling.

MODULE IV   INNOVATION   9

The Importance of Innovation - Risk of Failure - Nature of Creativity - Imagination-Managing Innovative Teams - Needs of Creative Teams - Team Dynamics -A Software Development Example - Manager's Responsibility - Team's Personal Needs - Political versus Technical Solutions - Team Synergism.

MODULE V   TEAM ENVIRONMENTANDRECOGNITION   9

Innovative Team Environment -Award Programs - Recognition Programs – An Example Award Plan - Industry Award Plans - Award Guidelines – Incentive Plans - A Caution on Recognition Programs

TOTAL HOURS:45

TEXT BOOK:

1. Watts S. Humphrey, "Managing Technical People: Innovation, Teamwork, and the Software Process", Addison-Wesley, 1996.

REFERENCES:

1. Saiyadain, M.S. Organizational Behavior, 2009, TataMcGrawHill.
2. Prasad C.M, Organizational Behavior, 2002, Publisher: SultanChandandSons.

OUTCOMES:

At the completion of this course students will be able to

- Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
- Assess the potential effects of organizational-level factors (such as structure, culture and change) on organizational behavior.
- Evaluate the potential effects of important developments in the external environment
- Describe the organizational behavioral issues in the context of organizational behavior theories, models and concepts.

CAC2218 **PYTHONLABORATORY** **L T P C**

0 0 4 2

OBJECTIVES

The aim of the course is to

- Define and structure the programcomponents
- Learn stringoperations
- Perform basic arithmeticoperations

LIST OF PROGRAMS

1. Write a Python program to check whether two strings are equal ornot.
2. Write a Python program to display reversestring.
3. Write a Python program to find the sum of digits of a givennumber.
4. Write a Python program to display a multiplicationtable.
5. Write a Python program to display all prime numbers between 1to10000.
6. Write a Python program to insert element in existingarray.
7. Write a Python program to sort existingarray.
8. Write a Python program to create object for Tree Set and Stack anduse allmethods.
9. Write a Python program to check all math classfunctions.
10. Write a program to execute any Windows 95 application (Like notepad, calculator etc)
11. Write a program to find out total memory, free memory and free memory after executing garbage Collector (gc).

TOTAL HOURS: 60

TEXT BOOKS:

1. LEARNING TO PROGRAM WITH PYTHON by RichardL.Halterman.(2011)
2. Guttag, John. Introduction to Computation and Programming UsingPython. Spring 2013 edition. MITPress,2013.

REFERENCES:

1. Programming Python, 4th Edition by Mark Lutz (2010)O'ReillyMedia
2. Python Cookbook, 3rd Edition: Recipes for Mastering Python 3,byDavid Beazley and Brian K. Jones, on O'ReillyAtlas(2013)

OUTCOMES:

At the completion of this course students will be able to

- Define the structure and components of a Python program
- Identify Python object types
- Write loops and decision statements in Python
- Implement lists, tuples, and dictionaries in Python programs
- Explore Python code structure, including the use of functions.

SEMESTER V

CAC3116   **DIGITAL MARKETING**   L   T   P   C

                                                                   3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
- Learn and develop, evaluate, and execute a comprehensive digital marketing strategy and plan
- Learn how to measure digital marketing efforts and calculate ROI
- Explore the latest digital ad technologies

MODULE I   INTRODUCTION TO DIGITAL MARKETING   9

Digital marketing, Marketing v/s Sales, comparison between digital and traditional marketing, Benefits of Digital marketing, Digital marketing platforms and Strategies, Defining Marketing Goals, Latest Digital marketing trends, Case studies of Digital Campaigns

MODULE II   SEARCH ENGINE OPTIMIZATION(SEO)   9

Components of Search Engines, SEO Keyword Planning, Meta Tags and Meta Description, Website Content Optimization, Back Link Strategies, Internal and External Links, Optimizing Site Structure Keywords in Blog and Articles, On Page SEO, Off Page SEO, Local SEO, Mobile SEO, Ecommerce SEO, Optimizing with Google Algorithms, Using Web Master Tool, Measuring SEO Effectiveness

MODULE III   SOCIAL MEDIA MARKETING (SMM)   9

Introduction to social Media Marketing, Benefits of using SMM, Social Media Statistics, Social Media Strategy, Facebook Marketing, Word Press blog creation, Twitter marketing, LinkedIn Marketing, Google plus marketing, Social Media Analytical Tools

MODULE IV   SEARCH ENGINE MARKETING (SEM)   9

Introduction to Search Engine Marketing, Tools used for Search engine Marketing, PPC/Google Adwords Tool, Display advertising techniques, Text Ads, CPC Bidding, CPC Bidding, Report generation

MODULE V   APPLICATION   9

Google Analytics, Online   Reputation Management, E-Mail Marketing, Affiliate Marketing, Social Media Analytics, Ad designing

TOTAL HOURS: 45

TEXT BOOKS
1. Ryan Deiss and Russ Hennesberry, "Digital Marketing forDummies",2017
2. Puneetsinghbhatia, "Fundamentals of DigitalMarketing",2017

REFERENCES
1. Introduction to Programmatic Advertising ByDominikKosorin,2016
2. Blogging: A Practical Guide to Plan Your Blog: Start Your Profitable Home-Based Business with a Successful Blog by Jo and DaleReardon,2015
3. Email Persuasion: Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing By IanBrodie,2013
4. Social Media Marketing All-In-One for Dummies By Jan Zimmerman and Deborah Ng,2017

OUTCOMES:

At the completion of this course students will be able to
- Define and explain various terminologies associated with Digital Marketing
- Apply the knowledge of Digital marketing concepts
- Construct an appropriate marketing model.
- Analyze role and importance of digital marketing in a rapidly changing business landscape
- Implement the key elements of a digital marketing strategy.

CAC3117   **ARTIFICIAL INTELLIGENCE**   L T P C
                                                                3 0 0 3

OBJECTIVES:

The objective of the course is to help students to,

- Understand the importance and basic concepts of Artificial Intelligence.
- Know the important artificial intelligence algorithms in analysis.
- Understand the importance of knowledge representation in Artificial intelligence.
- Know the basic concepts of machine learning in Artificial intelligence.

MODULE I   ARTIFICIAL INTELLIGENCE OVERVIEW   9

Overview: foundations, scope, problems, and approaches of AI. Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents, Artificial Intelligence programming techniques

MODULE II   PROBLEM SOLVING METHODS   9

Problem-solving through Search: forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications.

MODULE III   KNOWLEDGE REPRESENTATION AND REASONING   9

Knowledge Representation and Reasoning: ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

MODULE IV   PLANNING AND CONSTRUCTION   9

Planning: planning as search, partial order planning, construction and use of planning graphs, Representing and Reasoning with Uncertain Knowledge: probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, sample applications.

MODULE V   DECISION MAKING   9

Decision-Making: basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications. Machine Learning and

Knowledge Acquisition: learning from memorization, examples, explanation, and exploration. Learning nearest neighbor, naive Bayes, and decision tree classifiers, Q-learning for learning action policies, applications.

TOTAL HOURS: 45

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, 3rd Edition, by Stuart Russell and PeterNorvig.,2009
2. Luger, G. F., & Stubblefield, W. A., Artificial Intelligence - Structures and Strategies for Complex Problem Solving. New York, NY: Addison Wesley, 5th edition(2005).

REFERENCES:

1. Nilsson, N. J., Principles of Artificial Intelligence. Palo Alto, CA:Tioga(1981).
2. Rich, E., & Knight, K., Artificial Intelligence. New York:McGraw-Hill(1991).

OUTCOMES:

At the completion of this course students will be able to

- Summarize the different intelligent Programming Techniques
- Apply the appropriate Intelligent Programming Technique for the given problem.
- Construct the Ontology.
- Design the Planning Graph.
- Build game theory based Mathematical Model.

SEMESTER VI

CAC3204   ENTERPRISE APPLICATION DEVELOPMENT   L   T   P   C
                                                     3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Understand many domains those are providing enterprise services like banking, manufacturing and insurance etc.
- Develop an enterprise application, servers as well as supported servers commonly known as clusters
- Gain knowledge about various enterprise applications.
- Learn to use Java enterprise applications, enterprise architecture and enterprise mobility and provide training.

MODULE I   INTRODUCTION TO ENTERPRISE APPLICATION   9

Enterprise Architecture - Life Cycle, Development Framework, architectural model-Conceptual Layers, Enterprise IT architecture domain, Enterprise Server-Introduction, different types of enterprise servers, set up clusters; Enterprise Resource Planning (ERP)-Customer Relationship management (CRM)-Supply Chain Management (SCM) and HRM; Enterprise Java- Introduction to web application and its life cycle; Different containers.

MODULE II   WEB TIER   9

XML and Java API for XML processing – Introduction to JAXP; DOM, SAX and Stax Interface; XSLT; Serve lets- Introduction; Serve et Lifecycle; sessions; session tracking using hidden fields, user authentication, URL rewriting and cookies; Inter-serve let 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   ENTERPRISE INFORMATION SYSTEMSTIER   9

Java database connectivity – Introduction; Different types of drivers; Steps to establish a connection and query it; Java persistence API- JPA Architecture; Entities; Entity Relationship; Managing Entities; Java Transaction API (JTA) – Transactions in J2EE; Serializability; Concurrent Transactions; Distributed Transaction and Transaction manager; Mobile Database – Need for mobile database; Architecture; different products; Mobile transactions.

MODULE IV   BUSINESS TIER   9

Enterprise java Beans (EJB) – EJB Container; Enterprise Beans; Session Beans; Message driven beans; JAX-WS Web service endpoints- Introduction to creating web service client; Business Intelligence and Data-warehousing – Data Model; Data Integrity, OLAP,Application in an enterprise, Model view controller MVC Architecture – Introduction , Model1,Model2architecture.

MODULE V   ENTERPRISE MOBILITY   9

Introduction to Enterprise Mobility; Trends and Benefits, Drivers, Risks and analysis; Enterprise mobility architecture- High level architecture, Building MODULE s; Capability Model; Meta Model- Mobile Device security; Enterprise Mobility infrastructure; Secure VOIP; Enterprise Mobility Middleware solutions – MEAP s, Native Apps,HTML5

TOTAL HOURS: 45

TEXT BOOKS:

1. Head First Serve lets and JSP by Bryan Basham,Kathy Sierra and Bert Bates fromO'ReillyMedia,INC,2008
2. Java Server Faces: The complete Reference by Chris Schalk, Ed Burn sand JamesHolmes,2006
3. A practical Guide to Enterprise Architecture byJamesMcGovern,2003

REFERENCES:

1. David R Heffelfinger, Java EE 6 Development using Glass Fish Application Server,PacktPublishing.2014
2. Ted Neward Effective Enterprisejava2004
3. Robert Eckstein and J.Steven Perry Java Enterprise Bestpractices2002

OUTCOMES:

At the completion of this course students will be able to

- Describe the concepts of enterprise application development and enterprise mobility
- Analyze the various tiers in enterprise application development
- Develop java enterprise applications

CAC3205	PROJECT	L	T	P	C
		0	0	0	16

OBJECTIVES:

The main objectives of the Project is,

- To understand the software engineering process including budgeting through Project.
- To plan for various activities of the project and distribute the work amongst team members.
- To cultivate hardware implementation skills using an appropriate tool.
- To practice and develop presentation skills by giving seminars on the Project.
- To understand the importance of document design by compiling Technical Report on the Project work carried out

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

If the student chooses to undertake an industry project, then the topic should be informed to the mentor, and the student should appear for intermediate valuations. Prior to undertaking this project the students undergo a bridge course.

Bridge Course:

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

The Project:

Each student will be allotted a Faculty Guide and an Industry Guide during the internship/project work. Students need to maintain a Project Diary and update the project progress, work reports in the project diary. Every student must submit a detailed project report as per the provided template. In the case of team projects, a

single copy of these items must be submitted but each team member will be required to submit an individual report detailing their own contribution to the project student/group should be allotted a supervisor and periodic internal review shall be conducted which is evaluated by panel of examiners.

Project Evaluation Guidelines:

The Project evaluator(s) verify and validate the information presented in the project report.

The break-up of marks would be as follows:

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

Internal Evaluation:

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

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

External Evaluation:

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

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

The Final Project Report Details:

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

Viva Voce

➢ Handling questions

Clarity and Communication Skill Marking Scheme:

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

   For e.g., if the total mark for the project is 100, then Internal Evaluation = 35 marks

The break-up of marks is shown below:-
- Interim Evaluation 1:10marks
- Interim Evaluation 2:10marks
- Understanding of concepts:5marks
- Programming technique:5marks
- Execution of code : 5 marks

External Evaluation = 50 marks

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

The break-up of marks is shown below: -
- Questions related to project:10marks
- Questions related to technology:5marks

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

OUTCOMES:
On completion of the Project, students will be able to
- Apply the practical knowledge to solve real time applications
- Describe real time problem / research project scopes, objectives and deliverables.
- Design fundamental unified modeling language diagrams covering all modules of the project.
- Code effective programs to develop user interface design, processing logic and generate reports.
- Implement software/ electronic hardware by learning required testing and troubleshooting tools.
- Demonstrate the working project to the end user with consolidated project report.

TECHNOLOGY ELECTIVE I

CAC 1211	FUNDAMENTALS OF DATACENTER	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to:

- Know about Datacenter fundamentals
- Make the students to understand the basic concepts of Datacenter architecture.
- Setup services provided by datacenters.
- Network infrastructure in a Datacenter, server frames fault tolerance, Datacenter availability, network implementation and disaster recovery.

MODULE I　　　OVERVIEWOFDATACENTERS　　　　　　　9

Datacenters Defined, Datacenter Goals, Datacenter Facilities, Roles Datacenters in the Enterprise, Roles of Datacenters in the Service Provider Environment, Application Architecture Models. The Client/Server Model and Its Evolution, Then-Tier Model, Multitier Architecture Application Environment, Datacenter Architecture.

MODULE II　　　DATACENTER REQUIREMENTS　　　　　　9

DataCenter Prerequisites, Required Physical Area for Equipment and Unoccupied Space, Required Power to Run All the Devices, Required Cooling and HVAC, Required Weight, Required Network Bandwidth, Budget Constraints, Selecting a Geographic Location, Safe from Natural Hazards, Safe from Man-Made Disasters, Availability of Local Technical Talent, Abundant and Inexpensive Utilities Such as Power and Water, Selecting an Existing Building (Retrofitting), tier standard

MODULE III　　　DATACENTERDESIGN　　　　　　　9

Characteristics of an Outstanding Design, Guidelines for Planning a Data Centre, Data Centre Structures, No-Raised or Raised Floor, Aisles, Ramp, Compulsory Local Building Codes, Raised Floor Design and Deployment, Plenum, Floor Tiles, Equipment Weight and Tile Strength, Electrical Wireways, Cable Trays, Design and Plan against Vandalism. Data Centre Design Case Studies, Modular Cabling Design, Points of Distribution, ISP Network Infrastructure, ISP WAN Links, Data Centre Maintenance

MODULE IV   INTRODUCTION TO SERVER   9

Types of server farms and data centre, internet server farm, intranet server farm, extranet server farm , internet datacenter, corporate datacenter, software defined datacenter, datacenter topologies, Aggregation Layer, Access Layer, Front-End Segment, Application Segment, Back-End Segment, Storage Layer, Datacenter Transport Layer, Datacenter Services, IP Infrastructure Services, Application Services, Security Services, Storage

MODULE V   BUSINESS CONTINUITY AND DISASTER RECOVERY
**   FUNDAMENTALS   9**

Business continuance infrastructure services, the need for redundancy, Information availability, BC terminology, BC planning life cycle, BC technology solutions, backup and recovery considerations, backup technologies , Uses of local replicas, Local replication technologies , Restore and restart considerations , Modes of remote replications, remote replication technologies

TOTAL HOURS – 45

TEXT BOOKS:
1. Mauricio Arregoces, Maurizio Portolani, "Data Center Fundamentals", Cisco Press.2008
2. KailashJayaswal, "Administering Data Centers – Servers, Storage and Voice over IP", WileyPublishingInc.2011

REFERENCES:
1. IP Storage Networking by : Gary Oreinstein, Addison Wesley Professional, 2006
2. Information Storage and Management, G. Somasundaram – Alok Srivastava, Wiley.2012
3. Administering Data-Centers,KailashJayswal,Wiley.2015

OUTCOMES:
Upon completion of the course, the students will be able to:
- Describe the history of datacenters, how they have evolved over the years, different facilities and their requirements.
- Analyze different aspects that have to be considered while designing a datacenter and various server.
- Demonstrate an understanding of business continuity and disaster recovery fundamentals

CAC1207 INTRODUCTION TO MOBILE APPLICATIONS

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of the course is to help students to:

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development frameworks.
- Generate mobile application design.
- Implement the design using specific mobile development frameworks.
- Deploy the mobile applications in marketplace for distribution.

MODULE I INTRODUCTION 5

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications.

MODULE II BASIC DESIGN 8

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability

MODULE III ADVANCEDDESIGN 8

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

MODULE IV ANDROID 12

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

MODULE V IOS 12

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using

Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

TOTAL HOURS :45

TEXT BOOK:

1. Charlie Collins, Michael Galpin and Matthias Kappler, ―Android inPractice‖, DreamTech,2012.

REFERENCES:

1. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, ―Beginning iOS 6 Development: Exploring the iOS SDK‖,Apress,2013.
2. http://developer.android.com/develop/index.html.
3. James Dovey and Ash Furrow, ―Beginning Objective C‖,Apress,2012.
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
5. Reto Meier, ―Professional android Development, Wiley-India Edition,2012.

OUTCOMES:

Upon completion of the course, the students should be able to:

- Describe the requirements for mobile applications.
- Develop design for mobile applications for specific requirements.
- Implement the design using Android SDK.
- Implement the design using Objective C and iOS.
- Deploy mobile applications in Android and iPhone marketplace for distribution

CAC1225   **INTRODUCTION TO DATASCIENCE**   **L T P C**
                                                     3 0 0 3

OBJECTIVES:

The objective of the course is to help students to:

- Overview of the interdisciplinary concepts of Data Science in the real time applications.
- The importance of maths and statistics in data science.
- Role of machine learning techniques in data science.
- Integrated role of computers and its components.
- Flow and process model of data science project management.

MODULE I   **DATASCIENCE -AN OVERVIEW**   **9**

Introduction to Data Science, Definition and description of Data Science, history and development of Data Science, terminologies related with Data Science, basic framework and architecture, difference between Data Science and business analytics, importance of Data Science in today's business world, primary components of Data Science, users of Data Science and its hierarchy, overview of different Data Science techniques, challenges and opportunities in business analytics, different industrial application of Data Science technique

MODULE II   **MATHEMATICS ANDSTATISTICSIN**
                                 DATASCIENCE   **9**

Role of mathematics in Data Science, importance of probability and statistics in Data Science, important types of statistical measures in Data Science Descriptive, Predictive and prescriptive statistics, introduction to statistical inference and its usage in Data Science, application of statistical techniques in Data Science overview of linear algebra: matrix and vector theory, role of linear algebra in Data Science, exploratory data analysis and visualization techniques, difference between exploratory and descriptive statistics, EDA and visualization as key component of Data Science.

MODULE III   **MACHINELEARNING INDATASCIENCE**   **9**

Role of machine learning in Data Science, different types of machine learning techniques and its broad scope in Data Science: Supervised, unsupervised, reinforcement and deep learning, difference between different machine learning

techniques, brief introduction to machine learning algorithms, importance of machine learning in today's business, difference between machine learning classification and prediction.

MODULE IV   COMPUTERSINDATASCIENCE   9

Role of computer science in Data Science, various components of computer science being used for Data Science, role of relation data base systems in Data Science: SQL, No SQL, role of data warehousing in Data Science, terms related with data warehousing techniques, importance of operating concepts and memory management, various freely available software tools used in Data Science

MODULE V   SOFTWARETOOLSANDAPPLICATIONS   9

R, Python, important proprietary and open source software tools, different business intelligence tools and its crucial role in Data Science project presentation.

TOTAL HOURS– 45

TEXT BOOKS:
2. Data Smart: Using Data Science to Transform Information into Insight 1st Edition by John W. Foreman. (2015) Wiley Publication.
3. Data Science from Scratch: First Principles with Python 1st Edition by Joel Grus.

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

OUTCOMES:
After completing this course, students will be able to
- Distinguish between data Science terminologies and business analytics.
- Develop mathematical and statistical models for Data science applications.
- Apply appropriate machine learning technique for the data science application.
- Select appropriate software tools
- Install and configure the software tool and the data science application project.

CAC1231 **MULTIMEDIA TOOLS AND TECHNIQUES** **L   T   P   C**
                                                3   0   0   3

OBJECTIVES:

The objective of the course is to help students to:

- Know the Flash/Animate working environment and its terminology.
- Learn the different types of animation Flash/Animate supports.
- Import and use sound and sound effects in animation programs.
- Edit images in Photoshop

MODULE I   INTRODUCTION   9

What is multimedia: Definitions - Where to use Multimedia - Introduction to making Multimedia- The stages of a Project - What You Need – Multimedia Skills and Training: Basic Tools :Text Editing and Word Processing Tools - Painting and Drawing Tools - 3 D Modeling and Animation Tools - Image Editing Tools - Sound Editing Tools - Animation, Video and Digital Movie Tools –Helpful Accessories

MODULE II   VECTORAND RASTER GRAPHICS   9

Adding multimedia to the web-Raster image editing software Introduction -Image Basics-File Formats -GIF -JPEG -Color Palette –Color models-Layers -Creating new Images - Brushes –Grids and guides-Gradients -Scaling Images -Moving and Merging Layers - Tool Palette -Dialogs -masking –Filters –Adding text to images – Designing icons and background images.

MODULE III   IMAGEHANDLING   9

Introduction –Creating Simple Vector graphics –Creating banners -Images -Working with layers –Tweening -Motion guide –Masking –Frame by Frame animation –Onion Skin Effect –Creating special effects -Text effects and animation–Action scripts.

MODULE IV   ANIMATIONSANDINTERACTION   9

Creating clippings - Animations with sound effects -Adding audio or Video -Windows Media Player ActiveX Control -Real Player ActiveX control- web site with a particular theme using all the utilities -Graphics -Animations and Interaction.

MODULE V   PROJECTPLANNING   9

Estimating -Designing - Producing - Content and Talent- Acquiring Content - Using content created by others - Using Content created for a Project - Using Talent Delivering: Testing - Preparing for Delivery - Compact Disc Technology - Wrapping It Up - Delivering on the Worldwide Web.

TOTAL HOURS –45

TEXT BOOKS:
1. Richard Schrand, Photoshop 6 Visual Jumpstart, AdobePress2000.(II)
2. James L. Mohles, Flash 5.0 Graphics, Animation & Interaction, Macromedia2000. (III&IV)
3. Tay Vaughan, Multimedia: Making It Work, Fourth Edition - Tata McGraw Hill Edition, 1999.(I&V)

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

OUTCOMES:
On completion of the course, Students will be able to
- Identify the basic components, basic hardware and software requirements for multimedia development and playback.
- Apply animation principles in Multimedia application development..
- Identify and describe the function of the general skill sets in the multimedia industry.
- Apply animated contents in any Multimedia projects.
- Design and create animation using computerized animation tools.

TECHNOLOGY ELECTIVE - II

CAC2102   INFORMATION SECURITY FUNDAMENTALS   **L   T   P   C**
                                                                            3   0   0   3

OBJECTIVES:

The main objective of this course is to let the students:

- Learn the different types of Threats, Vulnerabilities, Risks and various terminologies in Information Security.
- Understand the formation of Security policy at various levels inside the Organization and provides the definition to Procedures, Standard and Guidelines.
- Understand the need of Performing Asset Classification and Declassification, Retention and Disposal of Information Asset.
- Identify the various levels of Authorization for access Viz., Owner, Custodian and User.
- Learn the different types of Access Controls and Physical security measures to safeguard the Assets.

MODULE I   INTRODUCTIONTO INFORMATIONSECURITY   9

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

MODULE II   THE NEED FOR ITSECURITY   9

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

MODULE III   RISKMANAGEMENT   9

Definition of risk management, risk identification, and risk control, Identifying and Accessing Risk, Assessing risk based on probability of occurrence and likely impact, the fundamental aspects of documenting risk via the process of risk assessment, the various risk mitigation strategy options, the categories that can be used to classify controls.

MODULE IV   NETWORK INFRASTRUCTURE SECURITY
AND CONNECTIVITY   9

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

MODULE V   INFORMATION ASSET CLASSIFICATION   9

Classification of Information, Information Assets – Owner, Custodian, User, Information Classification in terms of Secret, Confidential, Private and Public, Declassification. Retention and Disposal of Information Assets. Provide Authorization for Access – Owner, Custodian and User

TOTAL HOURS –45

TEXT BOOKS:
1. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerba, 2012
2. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1May2013)
3. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 5edition(2015)
4. Cryptography and Network Security Principles and Practices, by William Stallings, Pearson Education; Seventh edition (30June2017)

REFERENCES:
1. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – by DevenN.Shah,Wiley.
2. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley,2nd edition

OUTCOMES:
At the completion of this course students will be able to
- Describe the concepts of IT security, Threats, Vulnerabilities, Impact and control measures.
- Familiarize with Asset management along with the objective to create awareness in Digital Rights management.
- Analyze various levels of Authorization
- Analyze the Threats, Vulnerabilities and Risks in Information Security.
- Create Security policy at various levels inside the Organization

CAC2126   **BUSINESS INTELLIGENCE**   **L   T   P   C**

                                                        3   0   0   3

OBJECTIVES:

The objectives of this course are to let the students:
- Understand the importance of decision making in business
- Learn how data can be retrieved from various sources and how data can be represented in various formats
- Learn the importance of data mining and its applications
- Understand what is risk and how risk can be handled in business

MODULE I   INTRODUCTIONTOBUSINESSINTELLIGENCE   9

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

MODULE II   DATARETRIEVAL   9

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

MODULE III   PREDICTIVEANALYTICS   9

Data Mining Concepts and Applications, Data Mining Applications, Data Mining Process, Data Mining Methods, Data Mining Software Tools, Data Mining Privacy Issues, Myths, and Blunders, Basic Concepts of Neural Networks, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Web Mining Overview

MODULE IV   PRESCRIPTIVE ANALYTICS   9

Structure of Mathematical Models for Decision Support, Certainty, Uncertainty, and Risk, Problem-Solving Search Methods, Introduction to Knowledge Management, Approaches to Knowledge Management

MODULE V BUSINESSANALYTICS 9

Decision Support Systems, Introduction to customer relationship management, tools, case study: Tesco CRM, Apple CRM, KFC CRM.

TOTAL HOURS –45

TEXT BOOK:

1. Business Intelligence and Analytics: Systems for decision Support, Ramesh Sharda, DursunDelen, Efraim turban, Tenth edition,Pearson,2015.
2. Business Intelligence in Plain Language: A practical guide to Data Mining and Business Analytics byJeremyKolb,2016
3. Business Intelligence and Analytics, Drew Bentley, Librarypress,2017

REFERENCE:

1. Business Intelligence Strategy – A practical Guide for Achieving BI Excellence, John Boyer, Bill Frank, Brian Green Tracy Harris and Kay Van De Vanter, First Edition, IBM Corporation,2010.
2. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision Support Applications, Larissa T. Moss, ShakuAtre, Addison WesleyPublications,2003.

OUTCOMES:

On completion of this course, students will be able to

- Understand the basics of Business Intelligence
- Describe the infrastructure components of BI decision support system.
- Build prototype for developing a successful project
- Evaluate enterprise infrastructure
- Design the framework for Business Intelligence

CAC2131   INTRODUCTION TO SCRIPTING LANGUAGES   L   T   P   C
                                                                       3   0   0   3

OBJECTIVES:

The main objective of this course is to let the students:

- Learn about various scripting languages
- Know how the various scripting languages work
- Understand how VB Script and Java Script works
- To understand how error occurs and how to handle the errors

MODULE I   INTRODUCTION TO VB SCRIPT   9

Introduction - Adding VBScript Code to an HTML Page - VB Script Basics - VBScript Data Types - VBScript Variables - VBScript Constants - VBScript Operators – mathematical- comparison-logical - Using Conditional Statements - Looping Through Code - VBScript Procedures – type casting variables - math functions –date functions – string functions –other functions - VBScript Coding Conventions - Dictionary Object in VBScript - Err Object

MODULE II   INTRODUCTION TO JAVASCRIPT   9

Introduction– Advantages of JavaScript – JavaScript syntax - Data type –Variable - Array – Operator & Expression – Looping – control structures - Constructor Function – user defined function Dialog Box .

MODULE III JAVASCRIPT DOCUMENT OBJECT MODEL   9

Introduction – Object in HTML – Event Handling – Window object – Document object – Browser object – Form object – Navigator object – Screen object – Build in object – User defined object–Cookies.

MODULE IV   ASP.NET   9

Language Structure – Page Structure – Page event, Properties & Compiler Directives. HTML server controls – Anchor, Tables, Forms, Files. Basic Web server Controls – Label, Text box, Button, Image Links, Check & radio Button, Hyperlink, Data List Web Server Controls – Check box list. Radio button list, Drop down list, List box, Data grid, Repeater.

MODULE V ERROR HANDLING 9

Request and Response Objects, Cookies, Working with Data – OLEDB connection class, command class, transaction class, data adaptor class, data set class. Advanced issues – email, Application issues, working with IIS and page Directives, error handling. Security – Authentication, IP Address, Secure by SSL & Client Certificates

TOTAL HOURS –45

TEXT BOOKS:
1. Bayross, 2000, Web Enable Commercial Application Development Using HTML, DHTML, Javascript, Perl CGI, BPB Publications.
2. A.Russell Jones, Mastering Active Server Pages 3,BPBPublications.

REFERENCES:
1. HathleenKalata, Internet Programming with VB Script and JavaScript, Thomson Learning
2. Mike McGrath, XML Harness the Power of XML in easy steps, Dreamt ech Publications
3. T.A. Powell, 2002,Complete Reference HTML , TMH.
4. J.Jaworski, 1999, Mastering Javascript, BPB Publications.
5. Powell, Thomas; Schneider, Fritz, JavaScript: The Complete Reference, 2nd edition2004, TMH

OUTCOMES:
At the completion of this course students will be able to
- Implement basic JavaScript programs with simple and composite data types.
- Write simple JavaScript code to automate system administration tasks and rapidly
- Develop simple applications using object models and event handling mechanisms.
- Design Client side validation using JavaScript.
- Identify the errors and apply suitable error handling methods.

TECHNOLOGY ELECTIVE - III

CAC2231	WEB DESIGN AND DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Introduce the concepts and technologies used in web site design.
- Learn the Hypertext markup language's theoretical background of website design of frames and forms.
- Design web page with style sheet, bordering and image insertion.
- Design client side request dialogue box using scripting languages
- Design and generate server side response reports using scripting.

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 TEXTMARKUP LANGUAGE   9

Building Web Based Application using HTML**-**Html Document Structure, Various HTML Tags – Text Formatting Tag, Link Tag, List Tag, Image Tag, Table Tag, Line Breaks, Frames, Forms.

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 - Borders -Margins-Padding.

MODULE IV   CLIENT-SIDE SCRIPTING LANGUAGE   9

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

MODULE V   SERVER-SIDE SCRIPTING LANGUAGE   9

Introduction to PHP-Basic PHP syntax-PHP tags, PHP statements and whitespace, comments, Operators, Conditional and Looping Structure, User Define Functions,

TOTAL HOURS –45

TEXT BOOKS:

1. HTML: The Complete Reference, Thomas,2000(I,II&III)
2. Beginning JavaScript 2nd Edition, Wrox, Nicholas C.Zakas,2004(IV)
3. PHP Bible, Wiley Publication, Tim Converse, JoycePark,2002(V)

REFERENCES:

1. Developing Web Application, Wiley India Publication, Ralph Moseley, Wiley India,2007.
2. Web Enabled Commercial Application Development Using HTML,DHTML, PERL, Java Script, BPB Publications, IvanBayross,2005

OUTCOMES:

On completion of the course, Students will be able to

- Demonstrate the knowledge and ability to apply the design principles and techniques in creating websites.
- Identify HTML tags to construct the basic webpage.
- Incorporate CSS properties for layouts using a text editor to provide effective presentation of information in web pages.
- Client side request dialogue box with visual elements.
- Create dynamic website with server generated reports.

CAC2211	SERVER OPERATING SYSTEM	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Explore the usage of different features of Windows Server2012R2.
- Install, upgrade, and deploy the Windows Server.
- Configure core network services and the active directory of Windows Server.
- Provide the knowledge and skills necessary to plan and implement a Windows Server 2012 and Windows Server 2012R2environment.
- Train as server administrators who are responsible for the planning, operations, and day-to-day maintenance of Windows Server 2012 and Windows Server 2012 R2 servers in the enterprise.

MODULE I   INSTALLING AND CONFIGURING SERVERS   9

Selecting a Windows Server 2012:- Edition, Supporting Server Role, Supporting Server Virtualization, Server Licensing. Installing Windows Server 2012: System Requirement, Performing a Clean Installation, Installing Third-Party Drivers, Working with Installation Partitions, Using Server Core, Server Core Defaults, Server Core Capabilities, Using the Minimal Server Interface, Upgrade paths, Preparing to Upgrade Installation, Installing Windows Server Migration Tools. Configuring Servers: Completing Post- Installation Tasks and GUI Tools, Converting Between GUI and Server, ConfiguringNICTeaming, Using Roles, Features, and Services, Using Roles Manager, Adding Roles and Features, Deploying Roles to VHDs, ConfiguringServices

MODULE II   CONFIGURING LOCAL STORAGE   9

Planning Server Storage, Determining the Number of Servers Needed, Estimating Storage Requirements, Selecting a Storage Technology, Selecting a Physical Disk Technology, Using External Drive Arrays, Planning for Storage Fault Tolerance, Using Disk Mirroring, Using RAID, Using Storages Spaces, Understanding Windows Disk setting, selecting a Partition style, understanding disk and Volume Types, Choosing aVolume Size, Understanding File System, Working with Disks, Adding a New Physical Disk, Creating and Mounting VHDs, Storage Pool, Virtual Disks, Simple Volume, Creating a Striped, Spanned, Mirrored, or RAID-5 Volume, Extending and Shrinking Volumes and Disks

MODULE III   CONFIGURING FILE SHARING ACCESS   9

Designing a File-Sharing Strategy, Arranging Shares, Controlling Access, Mapping Drives, Creating Folder Shares, Assigning Permissions, Understanding the windows Permission Architecture and Basic, Advanced Permissions, Allowing and Denying Permissions, Inheriting Permissions, Understanding Effective Access, Setting Share Permissions, Understanding NTFS Authorization, Assigning Basic NTFS Permissions, Understanding Resource Ownership, Combining Share and NTFS Permissions

MODULE IV   CONFIGURING PRINT, DOCUMENTSERVICES,
SERVERS FOR REMOTE MANAGEMENT   9

Understanding the Windows Print Architecture and Printing, Server Printing Flexibility, sharing a Printer Drivers and Managing Printer Drivers, Using Remote Access Easy Print, Configuring Printer Security, Adding Printer Servers, Deploying Printers with Group Policy, Adding Server and Workgroup Servers, Calibrating Server Manager Performance, Configuring Win RM and Windows Firewall, Creating Server Groups, Using Remote Server Administration Tools, Using Windows Power Shell Web Access, Installing Windows Power Shell Web Access, Configuring the Windows Power Shell Web Access Gateway, Configuring a Test Installation, Customizing a Gateway Installation, Creating Authorization Rules, Working with Remote Servers.

MODULE V   CREATING AND CONFIGURING VIRTUAL MACHINE
SETTINGS AND STORAGE   9

Virtualization Architectures, Hyper-V Implementations and Licensing, Hyper-V Hardware Limitations and Server, Installing Hyper-V, Using Hyper-V Manager, Creating a VM, Installing an Operating System, Configuring Guest Integration Services, Allocating Memory, Using Dynamic Memory, working with Virtual Disks, Understanding Virtual Disk Formats, Creating Virtual Disks, Creating a New Virtual Disk, Adding Virtual Disks to Virtual Machines, Creating Differencing Disks, Configuring Pass-Through Disks, Modifying Virtual Disks, Creating Snapshots, Connecting to a SAN, Connecting Virtual Machines to a SAN

TOTAL HOURS – 45

TEXT BOOKS:

1. Windows Server 2012: A Handbook for Professionals by Aditya Raj(Author)

2. MCSA 70-410 Cert Guide R2: Installing and Configuring Windows Server2012
3. (Certification Guide) Hardcover – Import, 12 Sep 2014 by Don Poulton (Author), David Camardella (Author)

REFERENCES:

1. Windows Server 2012: A Handbook for Professionals by Aditya Raj (Author)
2. Administering Windows Server 2012 (Certification Guide) by Orin Thomas.

OUTCOMES:

At the completion of this course students will be able to

- Install and configure windows server 2012
- Configure local storage and other services like file sharing and print Sharing.
- Plan about the server infrastructure and key aspects of the implementation,
- Manage and maintain Active Directory and Network Infrastructure

CAC2206   **MOBILE AND WIRELESS SECURIY**   **L   T   P   C**

                                                              3   0   0   3

OBJECTIVES:

The aim of the course is to

- Introduce mobile communication terminologies.
- Know WAP Architecture threats and vulnerabilities existingin mobile communication networks.
- Train on securing information and data in environments like wireless, VoIP and Bluetooth.
- Apply mobile forensics on the user profile.
- Update knowledge on wireless security systems.

MODULE I   INTRODUCTION TO MOBILE COMMUNICATION   9

Introduction to Mobile communications, important terminologies, Evolution in Mobile Communication,1G,2G,3G,4G,5G.Protocols in mobile communication Representation of mobile communication with OSI model.GSM. GSM Protocol Architecture. GPRS. GPRS-features and benefits. GPRS – Applications, FDMA, TDMA, Multiplexing, CDMA. Overview of other protocols in Mobile Communication. DTAP (GSM), MM GSM, SM-TP, SS7, Important Security Considerations. Security Vulnerabilities. Security Attacks. Security Controls. Overview of3GSecurityArchitecture.4G Security Design Features. Threats, Risks and 4G Design Decisions. Security Features of GSM.GSM-Authentication. GSM-Key Generation and Encryption. Security Management in Mobile Communications. Security Standards.

MODULE II   WIRELESS SECURITY   9

Introduction to Wireless Security. Commonly used Terminologies in Wireless Security, WAP, What type of devices will use WAP? Why WAP? WAP Protocol Stack, WAP Architecture, How does WAP work, WML, Wireless services with which WAP works. WAP 2.0, WAP 2.0 Sync ML synchronization. WAP 2.0 Improvements, Working, WAP's Protocol Layer, Cellular Network, Wide Area Ethernet (WAE), Running an App using – WAE, Application, Wireless Telephony App(WTA) Protocol, Wireless Technology Standards,WiMAX,IEEE802.11standard, Global Wireless Standards, Bluetooth, Challenges of Wireless Security, Security Vulnerabilities, Security Attacks, Types of Attack, Confidentiality attacks, RADIUS, Integrity attacks, Authentication attacks, Availability attacks, Security Controls. Inbuilt Encryption Keys, Wireless Security Devices, Security Awareness, Secure Configuration, Wireless

Security Management, Commercial, Open Source.

MODULE III VOICE OVER INTERNET PROTOCOL(VOIP)SECURITY   9

Introduction to VOIP, VoIP Components, Signaling Gateway Controller, Media Gateway, Media Server, Application Server, VOIP Protocols, H,323Media Gateway Control Protocol (MGCP), Session Initiation Protocol (SIP), H.248 (also known as Media Gateway Control (Megaco), Real-time Transport Protocol (RTP), Real-time Transport Control Protocol (RTCP), Secure Real-time Transport Protocol (SRTP), Session Description Protocol (SDP), Jingle, Teamspeak, Skype, Security: VoIP vs POTS, Security: Threats, Attacks: SIP Attacks: Sniffing RTP, Security Threats and Define Mechanisms, Challenges for IP Telephony, Security Controls Counter measures.

MODULE IV MOBILE FORENSICS & DATA EXTRACTION   9

Mobile forensics process including seizure, data acquisition types like Physical, Logical, Manual, External & Internal memory, storage, analysis using tools & techniques.

MODULE V   SECURITY IN MOBILE APPLICATION DEVELOPMENT   9

Introduction to secure mobile application development, methods of protecting sensitive data on mobile devices, Introduction to Android Security, iOS Security and Windows Security.

TOTAL HOURS - 45

TEXT BOOKS:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by NinaGodbole, Wiley.
2. Cryptographyand Security by CKShyamala, NHarini and DrTRPadmanabhan, Wiley India,1sted;2011
3. Cryptography and Network Security by AtulKahate, McGraw Hill India,3rded; July 2017
4. Cryptography and Network Security by S. Bose, Pearson India, 1sted;March 2016
5. Cryptography and Information Security by V. K. Pachghare, Prentice HallIndia, 2ndreved;2015

REFERENCES:

1. Understanding Cryptography: A Textbook for Students and Practitioners Hardcover, Springer,1sted;2010
2. Introduction to Modern Cryptography by Jonathan Katz, Chapman &Hall/CRC Cryptography,2nded;2014
3. Everyday Cryptography: Fundamental Principles and Applications by Keith Martin, OUP Oxford,2nded;2017

OUTCOMES:

At the completion of this course students will be able to

- Explain the various types of mobile communications
- Analyze the various levels of wireless security
- Realize the need for Voice Over Internet Protocol security
- Analyze the need for mobile forensics

CAC 2223   BIG DATA ANALYTICS   L   T   P   C
                                                  3   0   0   3

OBJECTIVES:

The aim of the course is to

- Introduce the concepts of big data analytics
- Understand the big data framework and components of hadoop
- Practice the loading procedure of dataset into HDFS
- Execute map reduce program.
- Apply big data streaming for an industrial use case.

MODULE I   INTRODUCTION   9

Introduction – Why Big data - What is big data – Facts about Big Data - importance of Big Data Evaluation of Big Data – Market Trends – Sources of Data Explosion – Types of Data – Case Study for Netflix and the house of card. Need of Big Data – Big Data and its sources – Characteristics of Big Data – Difference between Traditional IT Approach and Big Data Technology – Capabilities of Big Data – Handling Limitations of Big Data - Technologies Supporting Big Data - Big Data Use Cases.

MODULE II   HADOOP COMPONENTS   9

Introduction – Why Hadoop? – What is Hadoop? – History and Milestone of Hadoop – Core Components of Hadoop – Difference between Regular File System and HDFS – Common Hadoop Shell Commands – Hadoop Configuration.

MODULE III HADOOP DISTRIBUTED FILESYSTEM(HDFS)   9

Concepts and Architecture - Data Flow (File Read, File Write) - Fault Tolerance - Java Base API - Different Daemons in Hadoop cluster (Name Node, Secondary Name Node, Job Tracker, Task Tracker and Data Node) - Loading a dataset into the HDFS.

MODULE IV   MAPREDUCE PROGRAM EXECUTION   9

What is YARN? – YARN Infrastructure - Introduction of Map Reduce – Analogy of Map Reduce – Map Reduce Architecture - Example of Map Reduce –Sorting, Shuffling – Reducing – Combiner – Partitioner – Creating Map Reduce program by using Eclipse.

MODULE V   BIG DATA STREAMING   9

Real time Big Data Streaming, Big data streaming framework, data streaming process, tools for big data streaming, industry use cases for big data streaming.

TOTAL HOURS - 45

TEXT BOOKS

1. Seema Acharya (Author), SubhashiniChellappan, Big Data and Analytics(2015). Wiley Publication.
2. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data (2015), EMC Education Services

REFERENCES

1. Big Data, Black Book: Covers Hadoop 2, Map Reduce, Hive, YARN, Pig, Rand Data Visualization (2016), DT Editorial Services
2. Tom White, Hadoop: The Definitive Guide, 4thEdition(2015)

OUTCOMES

At the end of the course student will be able to

- Select the appropriate tools based on the characteristics of given big data.
- Design exclusive hadoop framework and HDFS to the given industry use case
- To extract, transform and load data into HDFS file system and analyse data.
- To execute Map-Reduce program.
- Provide business competitiveness by processing big data streaming and delivering business insights.

TECHNOLOGY ELECTIVE –IV

CAC2203	CRYPTO GRAPHY FUNDAMENTALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Understand the need for the development of secured systems.
- Know the different types of algorithms in cryptography.
- Ensure the confidentiality and integrity of information.
- Learn about the several kinds of attack.
- Deploy cryptographic algorithm in the given application.

MODULE I   INTRODUCTION   9

The Confidentiality, Integrity & Availability (CIA) Triad, Cryptographic concepts, methodologies &practices, Symmetric& Asymmetric cryptography, public& private keys, Cryptographic algorithms and uses, Construction& use of Digital signatures

MODULE II   TYPES OF ALGORITHMS   9

The basic functionality of hash/crypto algorithms (DES, RSA, SHA, MD5, HMAC, DSA) and effects on key length concepts in Elliptical Curve Cryptography & Quantum Cryptography

MODULE III   KEY MANAGEMENT   9

The basic functions involved in key management including creation, distribution, verification, revocation and destruction, storage, recovery and life span and how these functions affect cryptographic integrity

MODULE IV   APPLICATION OF CRYPTOGRAPHY   9

Major key distribution methods and algorithms including Kerberos, ISAKMP etc., Vulnerabilities to cryptographic functions, the Use and functions of Certifying Authorities(CAs),Public Key Infrastructure (PKI) and System architecture requirements for implementing cryptographic functions

MODULE V   CRYPTOGRAPHY IN USER AUTHENTICATION   9

Basics of authentication, tokens, certificate-based and biometric authentication, extensible authentication protocols, message digest, security handshake pitfalls, SSO, attacks on authentication schemes, email security

TOTAL HOURS – 45

TEXT BOOKS:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by NinaGodbole,Wiley.2008
2. Cryptography and Security by C K Shyamala, N Harini and Dr TR Padmanabhan, Wiley India, 1sted;2011
3. Cryptography and Network Security by AtulKahate, McGraw Hill India,3rded; July 2017
4. Cryptography and Network Security by S. Bose, Pearson India, 1st ed;Mar2016
5. Cryptography and Information Security by V. K. Pachghare, Prentice Hall India, 2nd reved;2015

REFERENCES:

1. Understanding Cryptography: A Textbook for Students and Practitioners Hardcover, Springer, 1sted;2010
2. Introduction to Modern Cryptography by Jonathan Katz, Chapman &Hall/CRC Cryptography, 2nded;2014
3. Everyday Cryptography: Fundamental Principles and Applications by Keith Martin, OUP Oxford, 2nded;2017

OUTCOMES:

At the completion of this course students will be able to

- Demonstrate an understanding about Confidentiality, Integrity and availability in system
- designing
- Apply the cryptographic algorithms in the application with proper key management.
- Analyze about Cryptography in User authentication

CAC2222	NOSQL DATABASES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Introduce the requirement of unstructured data management.
- Learn different features of NO SQL
- Provide training to query the unstructured database.
- Know the graph databases

MODULE I   INTRODUCTION   9

The value of Relational Databases, Disadvantages of Relational Databases, A Brief History of NoSQL, Features of NoSQL: Features of NoSQL, ACID vs. BASE, Managing Different Data Types

MODULE II   DATA MODELS   9

Aggregates, key-value and document data models, Column-Family Stores, relationships, graph databases, schema-less databases, materialized views. Distribution models: Single Server, sharding, master-slave replication, peer-peer replication, sharding and replication

MODULE III   UPDATE AND READ CONSISTENCY   9

Update Consistency, Read Consistency. Relaxing Consistency: Relaxing Consistency, Relaxing Durability.

MODULE IV   NO SQL DATABASES   9

Key-Value Databases, Document Databases, Column-Family Stores – Compare SQL and No SQL Databases – Example Use case.

MODULE V   GRAPH DATABASES   9

Graph Databases, Beyond No SQL- Use case of Graph databases- Comparison of RDBMS and Graph Database-Predictive Analysis using Graph Databases

TOTAL HOURS - 45

TEXT BOOKS:

1. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Copyright © 2013 Pearson Education,Inc.2012.

2. NoSQL For Dummies®, 2015 by John Wiley &Sons ,Inc

3. Professional NoSQL,ShashankTiwari,Wrox

4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley,2012.

REFERENCES:

1. Lars George, "HBase: The Definitive Guide",O'Reilley,2011.

2. Eben Hewitt, "Cassandra: The Definitive Guide",O'Reilley,2010.

3. "MongoDB: The Definitive Guide" by KristinaChodorow,2015

OUTCOMES:

At the end of the course, the students will be able to:

- Identify the open source tool for storing unstructured data.
- Clearly understand the disadvantages of Relational database
- Incorporate features of NO SQL Data Base in the proposed system.
- Deploy Key-Value Databases and Document Databases.
- Integrate the Graph Databases as a value addition..

TECHNOLOGY ELECTIVE - V

CAC2212	INTRODUCTION TO CLOUD TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The aim of the course is to

- Introduce cloud computing terminologies and concepts.
- Understand the importance of distributed computing over network.
- Know different cloud types, services and security and select cloud provider
- Understand the seven step model of Cloud migration.
- Provide effective cloud governance.

MODULE I   INTRODUCTION   9

Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, , Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing.

MODULE II   MIGRATING TO CLOUD   9

Web-based business services, Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven- Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud., Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies

MODULE III SELECTION OF CLOUD PROVIDER   9

Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, Selecting the right scalable application. Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration.

MODULE IV   CLOUD GOVERNANCE   9

Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations

MODULE V   CLOUD SERVICES MANAGEMENT   9

Cloud financial issue - Cloud architecture- Cloud governance, Cloud strategy- Cloud Services Management - pilot project.

TOTAL HOURS – 45

TEXT BOOKS:

1. Cloud Computing: Concepts, Technology & Architecture, Ricardo Puttini, Thomas Erl, and ZaighamMahmood,PHI,2013.
2. Cloud Computing: Principles and Paradigms, RajkumarBuyya, JamesBroberg, Andrzej M. Goscinski, John Wiley and SonsPublications,2011

REFERENCES:

1. Mastering Cloud Computing, Buyya, Vecchiola and Selvi, Tata McGraw-Hill Education. ISBN,9332900949.2013.
2. Brief Guide to Cloud Computing, Christopher Barnett, Constable & Robinson Limited, 2010

OUTCOMES

At the completion of this course students will be able to

- Describe the cloud computing terminologies and concepts
- Clearly Understand the seven step model of Cloud migration.
- Analyze and select the right cloud service provider.
- Provide cloud governance solutions

CAC2209   INTRODUCTION TO ANDROID PROGRAMMING   L T P C
                                                     3 0 0 3

OBJECTIVES

The aim of the course is to

- Introduce Android Studio platform for mobile devices.
- Install Android studio and perform simple operations.
- Learn Android SDK and its environment.
- Design user Interface layout and elements
- Design data storage and publish app..

MODULE I   INTRODUCTION   9

Introduction, History, Features, Android Architecture, Versions/Evolution, Dalvik VM, Installing Android Studio (latest Version), Android Studio Environment, First Android Application, Application Folder Structure, Manifest file, R.java file, Activity, Activity life cycle, Application Components, Resource Files.

MODULE II   USER INTERFACE AND ELEMENTS   9

Layout, Linear Layouts, Relative Layout, Table Layout, Constraint Layout, View, Text View, Edit Text, Button, Events & Listeners, Image Button, floating Button, Auto Complete Text View, Radio Button, Radio Group, Toggle Button, Check Box, Spinner, Progress Bar. Toast, Alert Dialogs, Custom Alert Dialog.

MODULE III UI LIST, PICKER ELEMENTS & MENUS   9

List View, Array Adapter, Grid View, Table View, Custom List View, Menus, Option Menu, Context Menu, Popup Menu Time Picker, Date Picker

MODULE IV DATA STORAGE & MEDIA   9

Preferences, Shared Preferences, Internal Storage, External Storage, SQl Lite Database, Content Providers, Media API, Audio, Video, Camera

MODULE V   TESTING AND PUBLISHING APP   9

Introduction, Setting Up Kotlin Environment, Data Types, Control Statements, Classes & Objects, Interfaces, Extensions, Generics, Enums, Simple Android App using Kotlin, Unit Testing, Instrumentation Testing, Activity Testing, Publishing App to Google Play Store

TOTAL HOURS : 45

TEXT BOOKS:

1. John Horton, "Android Programming for Beginners", Packt Publishing Ltd, 31-Dec- 2015
2. Wei-Meng Lee, Jerome DiMarzio, "Beginning Android Programming with Android Studio", John Wiley &Sons,24-Oct-2016
3. Android Application Development Cookbook, by Wei-Meng Lee, John Wiley and Sons,2013

REFERENCES

1. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012
2. Android in Action, Third Edition, by W. Frank Ableson, RobiSen, Chris King, CEnrique Ortiz, 2012
3. Beginning Android 4, by Grant Allen,Apress,2011

OUTCOMES

At the completion of this course students will be able to

- Evaluate the various features of Android.
- Develop applications using various user interfaces
- Analyze the need for various menus in android.
- Explain the various types of testing performed on the apps

CAC2229   **EXPLORATORY DATA ANALYSIS**   **L   T   P   C**
                                                     3   0   0   3

OBJECTIVES:

The aim of the course is

- To understand the basic assumptions of EDA and techniques for interpretations.
- To apply auto correlation plot and auto regressive correlation plot.
- To perform Analysis of variance(ANOVA)
- Understand the importance of measure of dispersion and its interpretation in spreadness of data.
- To apply random walk in business case studies

MODULE I   **INTRODUCTION**   **9**

Introduction to Exploratory Data Analysis, Difference between classic data analysis and exploratory data analysis, difference between summary analysis and data exploratory analysis

MODULE II   **ASSUMPTIONS,TECHNIQUES AND INTERPRETATION**   **9**

Basic EDA assumptions, importance of underlying assumptions, techniques for testing assumptions, interpretation of 4-Plot, consequences of non-randomness, non-fixed parameters like location and variation parameters, consequences related to distributional assumptions.

MODULE III   **GRAPHICALTECHNIQUES**   **9**

EDA techniques, analysis questions, graphical techniques, auto correlation plot for random data, moderate correlation, strong and autoregressive correlation, sinusoidal correlation, Various Plot.

MODULE IV   **ANOVA**   **9**

Graphical techniques for EDA, Quantitative techniques, ANOVA, Bartlett's test, probability distributions, family of probability distribution, location and scale parameters, estimation of parameters, various distributions.

MODULE V   **CASESTUDIES**   **9**

EDA case studies – Random distribution, Random walk, standard resistor, Heat flow meter.

TOTAL HOURS: 45

TEXT BOOKS:
1. Exploratory Data Analysis by John W. Tukey (1977) –2016Reprint.
2. Exploratory Data Analysis with R by Roger Peng(2016).

REFERENCES:
1. Think Stats: Exploratory Data Analysis (2nd edition) by Allen B.Downey (2014)

OUTCOMES:

After completing this course, students will be able to:
- Do exploratory data analysis on a given dataset, They will be able to implement various probability distributions,
- Perform autocorrelation and ANOVA..
- Understand the EDA techniques & different kinds of techniques for testing.
- EDA case studies and interpretations.

CAC2232   **COMPUTER GRAPHICS**   **L   T   P   C**

                                                    3   0   0   3

OBJECTIVES:

The aim of the course is to

- Know graphics hardware devices and respective software.
- Understand the two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Appreciate illumination and color models.
- Understand clipping techniques.

MODULE I   INTRODUCTION   9

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines

MODULE II   GRAPHICS DRAWING   9

Line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

MODULE III   TWO-DIMENSIONAL GRAPHICS   9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing – viewing pipeline, viewing coordinate reference frame.

MODULE IV   CLIPPING   9

widow-to-viewport coordinate transformation, two-dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

MODULE V   THREE-DIMENSIONALGRAPHICS   9

Three dimensional concepts; Three-dimensional object representations – Polygon surfaces- Polygonables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations Translation, Rotation,

Scaling, composite transformations; Three-dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

TOTAL HOURS: 45

TEXT BOOKS:

1. John F. Hughes, Andries Van Dam, Morgan McGuire,David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: PrinciplesandPractice",3rd Edition, Addison-Wesley Professional,2013. (UNIT I, II, III, IV).
2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007 (UNIT V).

REFERENCES:

1. Donald Hearn and M. Pauline Baker, Warren Carithers, "Computer Graphics With Open GL", 4th Edition, PearsonEducation,2010.
2. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers,2006.

OUTCOMES:

At the end of the course, the student will able to:

1. Review the basic graphic devices .
2. Analyze two and three dimensional graphics.
3. Write basic graphics application programs..
4. Analyze the different types of clipping operations.
5. Design programs to display graphic images to given specifications

PROGRAMME ELECTIVE - I

CACX04   **E-COMMERCE**   L   T   P   C

                                                        3   0   0   3

OBJECTIVES:

The objective of the course is to ,

- Learn the E-Commerce Platform and its concepts
- Understand the Technology, infrastructure and Business in E-Commerce
- Understand the Security and Challenges in E-Commerce
- Build an Own E-Commerce using Open Source Frameworks

MODULE I   INTRODUCTION   9

Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce - The Importance of the Internet for E-commerce - The Growth of the On-Demand Economy.

MODULE II   BUILDING AN E-COMMERCE WEBSITE,

                          MOBILESITE AND APPS   9

Systematic approach to build an E-Commerce: Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App.

MODULE III E-COMMERCE SECURITY AND

                        PAYMENTSYSTEMS   9

E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems.

MODULE IV BUSINESS CONCEPTS IN E-COMMERCE   9

Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce.

MODULE V   PROJECT CASESTUDY   9

Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project: Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Open cart

TOTAL HOURS - 45

TEXT BOOKS:

1. E-commerce, MamtaBhusry, Firewall Media, An Imprint of Laxmi Publications Pvt. Ltd. Edition: First 2005

REFERENCES:

1. E-Commerce, P. T. Joseph, S. J. Third edition, Prentice Hall of India Pvt. Lt, New Delhi, 2008.
2. Electronic Commerce, PeteLoshin/ JhonVacca Firewall Media, An Imprint of Laxmi Publications Pvt. Ltd, NewDelhi , Fourth Edition: 2004
3. David Whiteley, " E-Commerce", Tata McGrawHill,2000
4. Eframi Turban, Jae Lee, David King, K. Michale Chung, "Electronic Commerce", PearsonEducation,2000

OUTCOMES:

At the completion of this course students will be able to

- Analyze the impact of E-commerce on business models and strategy
- Recognize and discuss global E-commerce issues
- Identify the strengths and weaknesses of different Electronic payment systems.
- Apply different cryptographic techniques

CACX47   **INFORMATION RETRIEVAL**   **L   T   P   C**
                                                          3   0   0   3

OBJECTIVES:

The objective of the course is to ,

- Learn the information retrieval models.
- Be familiar with Web Search Engine.
- Expose to Link Analysis.
- Understand Hadoop and Map Reduce.
- Learn document text mining techniques.

MODULE I   INTRODUCTION   9

Introduction -History of IR- Components of IR – Issues –Open source Search engine Frameworks–The impact of the web on IR– The role of artificial intelligence (AI)in IRIR Versus Web Search – Components of a Search engine-Characterizing the web.

MODULE II   INFORMATION RETRIEVAL   9

Boolean and vector-space retrieval models- Term weighting – TF-IDF weighting cosine similarity – Preprocessing – Inverted indices – efficient processing with sparse vectors – Language Model based IR – Probabilistic IR –Latent Semantic Indexing – Relevance feedback and query expansion.

MODULE III   WEB SEARCH ENGINE – INTRODUCTION
                     AND CRAWLING   9

Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement – search engine optimization/spam – Web Search Architectures – crawling – meta-crawlers- Focused Crawling – web indexes –- Near-duplicate detection – Index Compression – XML retrieval.

MODULE IV WEB SEARCH – LINK ANALYSIS
                     AND SPECIALIZEDSEARCH   9

Link Analysis –hubs and authorities – Page Rank and HITS algorithms - Searching and Ranking – Relevance Scoring and ranking for Web – Similarity – Hadoop& Map Reduce Evaluation – Personalized search – Collaborative filtering and content-based recommendation of documents and products – handling "invisible" Web – Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.

MODULE V   DOCUMENT TEXT MINING   9

Information filtering; organization and relevance feedback – Text Mining -Text classification and clustering – Categorization algorithms: naive Bayes; decision trees; and nearest neighbor – Clustering algorithms: agglomerative clustering; k means; expectation maximization (EM).

TOTAL HOURS- 45

TEXT BOOKS:
1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge UniversityPress,2008.
2. Ricardo Baeza -Yates and BerthierRibeiro – Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition AddisonWesley,2009.

REFERENCES:
1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MITPress,2010.
2. OphirFrieder "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series ", 2nd Edition, Springer,2004.
3. Manu Konchady, "Building Search Applications: Lucene, Ling Pipe", and First Edition, Gate Mustru Publishing, 2008.

OUTCOMES:
On Completion of the course the students will be able to,
•   Apply information retrieval models.
•   Design Web Search Engine.
•   Use Link Analysis.
•   Use Hadoop and Map Reduce.
•   Apply document text mining techniques

CACX48   **SOCIAL MEDIA ANALYSIS**   **L   T   P   C**

                                                           3   0   0   3

OBJECTIVES:

The objective of the course is to ,

- Give an overview of social networks and its importance.
- Understand the social network concepts and various methods of analysis.
- Expose and train on various tools and techniques for analyzing and visualizing social media networks.

MODULE I   **INTRODUCTION TO SOCIAL NETWORKS AND SNA**   **8**

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.

MODULE II   **NETWORK CONCEPTS**   **8**

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 .

MODULE III   **SOCIAL NETWORK ANALYSIS FUNDAMENTALS**   **9**

Points, Lines and Density – Centrality and Centralization – Components, Cores and Cliques – Positions, Roles and Clusters – Dimensions and Displays.

MODULE IV   **METHODS OF SOCIAL NETWORK ANALYSIS**   **10**

Graphs – Matrices – Relationship Measures – Centrality and Prestiges – Cliques – Structural Equivalence – Visual Displays – Book models – Network Position Measures – Logit Models – Affiliation networks – Lattices- Levels of Analysis

MODULE V   **TOOLS AND TECHNOLOGIES**   **10**

Twitter Analytics – Facebook Analytics – Google+ Analytics – Google+ Ripples – R for Social Network Analysis – Pajek – Network Visualization Tools – Analyzing Social Media Networks with NodeXL.

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", 2ndEdition,SAGE Publications,2007.

REFERENCES:

1. Christina Prell, "Social Network Analysis: History, Theory and Methodology", 1st Edition, SAGE Publications Ltd, 2012.

OUTCOMES:

At the completion of this course students will be able to

- Analyze social network data using various software packages.

- Implement statistical models of social networks to analyze network formation and evolution

- Implement the basic concepts and theories of network analysis in the social sciences

- Use statistical software to visualize networks and analyze their properties.

CACX49   **ONLINE COMPUTER ADVERTISING**   L   T   P   C

                                                            3   0   0   3

OBJECTIVES

The objective of the course is to

- Provide an understanding of the Internet as advertising and the process of selling an online ad program
- Know the trends and issues concerning the current and evolving forms of Internet- based advertising and brand communication media;
- Provide an overview of the processes and elements considered in the Conceptualizing and production of integrated brand communication campaigns
- Learn how online ads are priced and delivered, along with key measurement metrics

MODULE I   ONLINE ADVERTISING   9

Internet advertising- Definition-Advantage-Players in the Internet advertising Industry-Online Ad models-Advertising via email-web-testing-buttons-text links sponsorships-push technology-Interstitials-screensavers-bookmarks-cursorsUndervalued web space

MODULE II   TARGETING APPROACHES   9

A Unique Element in Online Advertising-Demographic Targeting -Contextual Targeting- Behavioral Targeting-Geographic Targeting -Affinity Targeting - Purchase-Based Category Targeting-Key Considerations in Online Targeting - Direct Email-Banner advertising-Mini-page-Direct response piece-Loyalty programs-coupons-free samples- trials-contests and games

MODULE III   DISPLAY ADVERTISEMENT ONLINE   9

Standard Online Advertising Formats-Creative Factors That Influence Display Advertising -Effectiveness-Rich Media Advertising on Broadband-Online Video Advertising Online Advertising Reach and Frequency Concepts-Strategies for Managing Online Reach and Frequency- Frequency of Online Advertising-Reach and Site Visiting-Winning Strategies in Online Advertising -Generate Leads and Acquire Customers- Generate Brand Preference to Stimulate Sales -Brand Growth, Rewards, and Loyalty

MODULE IV   WEB MEASUREMENT   9

Terminology –Log Analysis-Web measurement Tools-Problems with Web measurement -Ad Management-Ad Management for Publishers–Advertisers – Targeting –Content and context-Registration Information-Database Mining Profiling and Personalization-Pricing Online Ads-Pricing Models-Trends in pricing

MODULE V   BUYING AND SELLING ONLINE ADS   9

Buying Online Ads-Determine campaign goals-Site selection process –Paying for Media buys-Pricing for buys-Allocating campaign budget -Selling Online Advertising-Preparing site's infrastructure-Monitoring and measuring traffic-Ad models Ad management- Auditing-Media kit- selling strategies-Sales Staff

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.

REFERENCE BOOKS:

1. RobbinZeff and Brad Aronson (ZA book from here on), Advertising on the Internet, 2nd edition, John Wiley & Sons, Inc. (New York, NY),1999.

OUTCOMES

At the completion of this course students will be able to

- Analyze the relevant theories, practice, digital ads, legal issues, ethical challenges in the fields of advertising and marketing communication.
- Design effective visual communication for various advertising approaches that combine the use of print, online/digital and other multimedia communication.
- Create different strategies and execution of an ad campaign for a client(s).
- Develop advertising media buying and planning strategies.

CACX50   **PHP PROGRAMMING**   **L   T   P   C**
                                           3   0   0   3

OBJECTIVES:

The objective of the course is to

- Learn how to build good web applications using PHP language.
- Install PHP and work with arrays and regular experiment.
- Handle the exceptions and file operations.

MODULE I   INTRODUCTIONTOPHP   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 Expression.

MODULE II   ADVANCEDPHP   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.

MODULE III   PHPFORMSANDIMAGES   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 IV PHPWITH MYSQLANDCMS   9

Database Basics-My SQL Create-database operation-Executing Query-Joins-Order By- Group By-Advantages of a CMS, Different types of CMS, Examples , Drupal -- Installation – Content Management, Structure – Site Building – MODULE s – Theming.

MODULE V   PHPAPPLICATIONFRAMEWORKS   9

Web Development Frameworks – Introduction – Yii – Model View Controller –Yii PHP framework– PHP XML Parsers-PHP XML Expat-PHP XML DOM-PHP Mail.

TOTAL HOURS: 45

TEXT BOOK:

1. Kevin Tatroe, Peter MacIntyre, RasmusLerdorf, "Programming PHP", Creating Dynamic Web Pages, O'Reilly Media, 3rdEdition,2013

REFERENCES:

1. http://php.net
2. http://www.tutorialspoint.com/php/index.html

OUTCOMES:

On completion of this course, students will be able to

- Design a web project to use real-time processing capabilities to interact with a database.
- Test and debug PHP application
- Apply the Model View controller pattern for web applications
- Pass information from client browser to web server for transaction processing

CACX51	WEB MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to

- Provide students with a sound basis in Web data mining tasks and techniques.
- Ensure that students are able to implement and to use some of the important Web Mining algorithms.
- Evaluate Web Mining techniques in their workplace.

MODULE I   INTRODUCTION TO WEB INTELLIGENCE   9

Historical Perspective - Towards Intelligent Web - Knowledge Web Mining- Building Better Web sites using Intelligent Technologies - Benefits of Intelligent Web

MODULE II   WEB USAGE MINING   9

Introduction to Web Mining- Web usage Mining - Web Log Processing -Analyzing Web Logs- Web Usage Mining Applications

MODULE III   WEB CONTENT MINING   9

Introduction- Data Collections - Search Engines - Robot Exclusion - Personalization of Web Content - MULTIMEDIA INFORMATION RETRIEVAL

MODULE IV   WEB STRUCTURE MINING   9

Introduction - Modeling Web Topology - Other Approaches to Studying the Web-Link Structure.

MODULE V   WEBMINING APPLICATIONS   9

Data integration for e-commerce - Web personalization - Web content and structure mining- Web data warehousing - Review of tools, applications, and systems

TOTAL HOURS: 45

TEXTBOOKS:

1. Data Mining Techniques for Marketing, Sales, and Customer Relationship Management, Third Edition, by Michael Berry and Gordon Linoff, JohnWiley,2011

2. Data Mining: Practical Machine Learning Tools and Techniques, bylan Witten and Eibe Frank, 3rd Ed., MorganKaufmann,2011

3. Web Data Mining: Exploring Hyperlinks, Content, and Usage Data, by Bing Liu, 2nd Edition, Springer,2011.

REFERENCES

1. R. Akerkar& P. Lingras; Jones &Bartlett Building an Intelligent Web: Theory & Practice,2007.

2. Mining the Web, Discovering Knowledge from Hypertext Data, SoumenChakrabarti, Morgan KaufmannPublishers,2003

OUTCOMES:

At the completion of this course students will be able to

- Apply web mining techniques and analyze complex information and social networks.

- Become familiar with classic and recent developments in Web search and data mining skills

- Implement the Search engine techniques and Page ranking methodology in web search

- Describe several models to interpret emergent features such as the structure and evolution of the Web graph, its traffic patterns, and Information retrieval.

- Apply technical and analytic skills to develop significant Business Intelligence from online resources.

CACX52   **HUMAN COMPUTER INTERACTION**   L T P C
                                                           3 0 0 3

OBJECTIVES

The objective of the course is to ,

- Determine the need for computers and evaluate the use of computers
- Identify the stages in software engineering that need to be modified for effectiveness of interacting with computers
- Discover the various models that can be used for designing system

MODULE I   DESIGN PROCESS   9

Introduction : Importance of user Interface – definition, importance of good design. Benefits of good design. Need for Interaction – Models –– Paradigms – Designing of Interactive systems – Usability –– Interaction design basics – Complexity of design Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds

MODULE II   DESIGN AND EVALUATION OF
                   INTERACTIVE SYSTEMS   9

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, - Principles of user interface. Design rules – maximum usability – Principles – Standards and guidelines – design patterns

MODULE III   SOFTWARE TOOLS AND COMPONENTS   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   9

Universal design principles – Multimodal systems – User Support – Presentation and Implementation Issues – types – requirements – approaches – Cognitive model – Hierarchical model – Linguistic model – physical and device models – Socio-technical models – Communication and Collaboration models – Task models – Task analysis and design

MODULE V   EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI   9

Basic Design structure – Single independent variable – multiple independent variable – factorial design – split-plot design – random errors – experimental procedure – Statistical analysis – T tests – Analysis of Variance test – Regression – Chi-Square test – Survey – Probabilistic sampling – Non-probabilistic sampling – developing survey questions

TOTAL HOURS: 45

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition PrenticeHall,2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction,Wiley,2010.
3. The essential guide to user interface design, Wilbert O Galitz,WileyDreama Tech.

REFERENCES

1. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Ealg, Human – Computer Interaction.PEARSON,2003
2. Prece, Rogers Wiley Dream tech InteractionDesign,2011

OUTCOMES

On completion of this course, students will be able to

- Explain Computer components functions regarding interaction with human
- Demonstrate Understanding of Interaction between the human and computer
- components.
- Implement Interaction design basics
- Implement various test strategies in statistical analysis.

TECHNOLOGY ELECTIVE LAB - I

CAC2233   **WEBDESIGNLABORATORY**   L T P C
                                          0 0 4 2

OBJECTIVES:

The aim of the course is to

- Develop Web pages that present information, graphics and hypertext links to other Web pages in a cohesive manner
- Identify HTML tags and CSS properties and use the text editor to construct the basic HTML and CSS structure for a webpage
- Validate forms using JavaScript.

LIST OF PROGRAMS

1. Create a webpage to illustrate text formatting tags, order and unordered list
2. Develop a web page to display table and frames
3. Create a web page to embed an image map in webpage.
4. Create a web page with all types of Cascading style sheets.
5. Design a web page using different CSS properties like border, background, text, and font.
6. Client Side Scripts for Validating Web Form Controls
7. Develop a simple calculator using JavaScript
8. Designing a digital clock using JavaScript
9. Demonstrate string and math objects predefined methods available in JavaScript
10. o create a html registration form and perform validation.

TOTAL HOURS – 30

TEXT BOOKS:

1. Developing Web Application, Wiley India Publication, Ralph Moseley, WileyIndia, 2007.
2. Web Enabled Commercial Application Development Using HTML,DHTML,PERL, Java Script, BPB Publications, IvanBayross,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, JoycePark,2002(V)

OUTCOMES:

At the completion of this course students will be able to

- Develop web pages using HTML tags and Cascading Style Sheets.
- Develop web pages using Frames and Forms with controls.
- Develop Client side scripting using JavaScript .

CAC2219 SERVER OPERATING SYSTEM LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

Aim of the course is to provide:

- Network foundation from which learner can centrally manage settings on any computer that works on Windows operating system.
- The students will have the functional knowledge of configuring core network services and the active directory of Windows Server.

LIST OF EXPERIMENTS:

1. Installation of WindowsServer2012
2. Installation of Active Directory domain services and adds a client to the domain.
3. Administrator of a company named ABC needs to create a group by assigning file Permissions to specific users and configure in a way that the file should be made Available even in offline mode.
4. Consider two physical disk of 1 TB each, where one disk has been damaged due natural calamities. Configure a high availability storage technique having fault tolerance to overcome the above scenario.
5. Creating Virtual machine in windows server.
6. A company named XYZ had started its branch office in Bangalore and Coimbatore. Configure in such that they should come under the head office and able to access their resources from the same.
7. Configuration of windows server for remote management
8. Rahul wants to host a file in such a way that the changes made by the client have obe updated in the database of the server. Configure the information service technique that performs the above activity.
9. Create a scenario based on real time domain.

TOTAL HOURS – 60

TEXT BOOKS:

1. Windows Server 2012: A Handbook for Professionals by Aditya Raj(Author)
2. MCSA 70-410 Cert Guide R2: Installing and Configuring Windows Server2012
3. (Certification Guide) Hardcover – Import, 12 Sep 2014 by Don Poulton (Author), David Camardella (Author)

REFERENCES:
1. Windows Server 2012: A Handbook for Professionals by Aditya Raj (Author)
2. Administering Windows Server 2012 (Certification Guide) by Orin Thomas.

OUTCOMES:

At the completion of this course students will be able to

- Manage the settings on any computer that works on Windows operating system.
- Install and configure windows server2012.
- Demonstrate functional knowledge of configuring core network services

CAC2210   **ANDROID LABORATORY**   **L   T   P   C**

                                                     0   0   4   2

OBJECTIVES

The aim of the course is to

- Provide practical experience to students and reinforce the theory concepts.
- Learn the basics of Android platform and get to understand the application lifecycle.
- Identify, analyse and choose tools for Android application development.

LIST OF PROGRAMS:

1. Display Hello World
2. Add two Edit Text. When a number is entered in Edit Text 1, the square of that number should be displayed in EditText2.
3. Add an Edit Text and a button. When the button is clicked, the text inputted inEdit Text should be retrieved and displayed back to the user.
4. Add two Edit Text and a button. When the button is clicked, the text inputted in Edit Text 1 should be retrieved and displayedinEditText2.
5. Program a calculator
6. Create a Unit convertor for height
7. Create a Unit convertor for height and weight in the same application. Selection of height/weight can be done using a spinner.
8. Add a spinner. When the spinner is selected, there should be three options (e.g., android, java, testing). When you click on each option, it should go to another page containing some other components. Each of these pages should have a "back" button, which on pressing will take you back to the page with the spinner.
9. Create applications to include Action Bar, Menus, Dialogs and Notifications.
10. Create a user login form and registration form. First time users have to register through the registration form and the details should be stored in the database. Then they can login using the login page.
11. Create a camera application, where you can click a picture and then save it as the wallpaper.
12. Create a media player which plays anmp3song.
13. Create a simple task manager application, built for day-to-day life where

one can keep track of his/her most important projects, task or notes. User can take notes for their most important trainings or meetings from their phone - even in offline mode. The application should have a Registration screen, Login screen and Main screen. In Main screen user has to create new notes and can view the list of tasks.

14. Create an online Food Ordering application based on Android which includes Restaurant profile, new order, order status, customer profile management and setting profile features. This application is to help restaurants in receiving order, to give information required by the customer and making order instantly.

15. Develop a Voice Alert Android application to display a text message with voice alert. The android mobile speaks to the user when the following events are triggered while storing the received message, a dialog box with three buttons "READ", "DELETE" and "CANCEL". When the user tells "READ" the android application reads the sender's mobile number as well reads the message content and when the user tells "DELETE" it deletes the message.

16. Create a scenario based on real time domain.

TOTAL HOURS: 60

TEXT BOOKS:
1. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012
2. Beginning Android 4, by Grant Allen, Apress, 2011.

OUTCOMES

At the end student will be able to
- Work on the tasks provided to them in the form of experiments and write programs to produce the desired result.
- Build and deploy Android application.
- Understand the UI - components, layouts, event handling, and screen orientation.
- Use Java for rapid App development.

CAC2230   BIG DATA ANALYTICS LABORATORY   L   T   P   C
                                                    0   0   4   2

OBJECTIVES:

- To provide students hands-on training in big data analytics.

LIST OF PROGRAMS:

1. Install and configure Hadoop, set working directory and various processes.
2. Implement basic commands in Hadoop to manipulate big data.
3. Set up Hadoop cluster configuration.
4. Implement HDFS and explore its characteristics
5. Explore the properties of YARN
6. Import data from MySQL into HDFS
7. Import data from MS Excel into HDFS
8. Implement reducer in Hadoop
9. Implement practitioner in Hadoop
10. Implement nested Map Reduce
11. Create a scenario based on real time domain

CASE STUDY1:

Experiment 1:

Due to the advent of new technologies, devices, and communication means like social networking sites, the amount of data produced by mankind is growing rapidly every year. The amount of data produced by us from the beginning of time till 2003 was 5 billion gigabytes. If you pile up the data in the form of disks it may fill an entire football field. The same amount was created in every two days in 2011, and in every ten minutes in 2013. This rate is still growing enormously. Though all this information produced is meaningful and can be useful when processed, it is being neglected. By 2020, 1.7megabytes of data will be created every second, for every person on earth.

There are different uses of Big Data, but not only limited to, Industry influencers, academicians, and other prominent stakeholders certainly agree that big data has become a big game changer in most, if not all, types of modern industries over the last few years. As big data continues to permeate our day-to-day lives, there has been a significant shift of focus from the hype surrounding it to finding real value in its use.

Considering Big Data in general, explain different use cases for below mentioned domain and comment how companies are converting Big Data into profit:

- Healthcare
- Education
- Agriculture
- Space Technology

Experiment 2:

Prepare infrastructure for setting up single node Hadoop cluster.

Experiment 3:

Install all the software to set up single node Hadoop cluster.

Experiment 4:

Configuration of single node Hadoop cluster and testing by creating directory at HDFS location

Experiment 5:

You need to find the location of below Hadoop configuration file and understand the purpose of different attributes mentioned in below xml files.

hdfs-site. xmlcore-site.xml,   yarn-site.xml

Experiment 6:

You need to perform 20 basics Hadoop commands on single node Hadoop cluster. (Faculty will share commands)

Experiment 7:

Install IDE to code and compile map reduce framework.

Experiment 8:

You need to program Mapper Class, Reducer Class and Driver Class for map reduce word count Job.

Experiment 9:

You need to find out word count job for the given input file provided by faculty.

Experiment 10:

You need to trouble shoot log file generated in experiment Number 09 and note all the steps involved in job execution

Experiment 11:

You need execute word count job based on 0 reducer, 2 reducer, Default reducer & 4 reducer and observe different outputs.

Case Study 2:

Consider a scenario; you are working for a start-up company. Your cluster size is 10 Node. Number of data node in your cluster is 09. The size of each data node of your cluster is 2 TB. Currently you are working on 5 Tb of Data with Replication factor 03. Recently you got a new project from your client. You are expecting 20Tb of data to be processed in your cluster. Based on above scenario, you need to explain below:

1. How many data node you are going to add in your cluster?
2. What will be your new cluster size?
3. What will be your new data size considering Replication factor?
4. What will be your new data size considering only original data (without Replication)?
5. What will be your total number of task tracker in your cluster?

TOTAL HOURS: 60

REFERENCES:

1. Big Data, Black Book: Covers Hadoop 2, Map Reduce, Hive, YARN, Pig, Rand Data Visualization (2016), DT Editorial Services
2. Tom White, Hadoop: The Definitive Guide, 4thEdition(2015)

OUTCOMES:

After completing this laboratory, students will be able to:

- To extract, transform and load data into HDFS file system and analyse data.
- To execute Map-Reduce program.
- Provide business competitiveness by processing big data streaming and delivering business insights.

TECHNOLOGYELECTIVE – VI

CAC3101   COMPUTER FORENSICS AND INVESTIGATION   L   T   P   C
                                                         3   0   0   3

OBJECTIVES

The objective of the course is to help students to

- Gain knowledge about complexities of thecybercrimes
- Learn different forms of cybercrime and its implications and duties of professionals employed at different levels towards analyzing and controlling cybercrime.
- Get familiar with the methods to recover data from storage devices are covered in followingchapters.

MODULE I   COMPUTERFORENSICS   9

Introduction to Computer Forensics, Forms of Cyber Crime, First Responder Procedure- Non-technical staff, Technical Staff, Forensics Expert and Computer Investigation procedure, Case Studies

MODULE II   STORAGE DEVICES & DATARECOVERMETHODS 9

Storage Devices- Magnetic Medium, Non-magnetic medium and Optical Medium, Working of Storage devices-Platter, Head assembly, spindle motor, Data Acquisition, Data deletion and data recovery method and techniques, volatile data analysis, Case Studies

MODULE III   FORENSICSTECHNIQUESI   9

Windows forensic, Linux Forensics, Network forensics – sources of network-based evidence, other basic technical fundamentals, Network forensic investigative strategies, technical aspects, statistical flow analysis, packet analysis, forensics of wireless networks, network intrusion detection analysis, event log aggregation andcorrelationanalysis, switches, routers and firewalls, Case Studies, Mobile Forensics – data extraction & analysis, Steganography, Password cracking, Case Studies

MODULE IV   FORENSICSTECHNIQUESII   9

Cross-drive analysis, Live analysis, deleted files, stochastic forensics, Dictionary attack, Rainbow attack, Email Tacking – Header option of SMTP, POP3, IMAP,

examining browsers, Case Studies

MODULE V   CYBERLAW   9

Corporate espionage, digital evidences handling procedure, Chain of custody, Main features of Indian IT Act 2008 (Amendment), Case Studies, Incident specific proceduresvirus and worm incidents, Hacker incidents, Social incidents, physicalincident, Guidelines for writing forensicreport

TOTAL HOURS – 45

TEXT BOOKS:

1. Computer Forensics: Computer Crime Scene Investigation by John Vacca, LaxmiPublications, 1sted;2015
2. Digital Forensic: The Fascinating World of Digital Evidences by NilakshiJain, et.al, Wiley, 1sted;2016
3. The Basics of Digital Forensics: The Primer for Getting Started inDigital Forensics by John Sammons, Syngress, 2nded;2014
4. Cyber Forensics in India: A Legal Perspective by NisheshSharma,Universal Law Publishing - an imprint of LexisNexis; First2017edition
5. Network Forensics:Tracking Hackers Throu by Davidoff, Pearson India, 1sted; 2013

REFERENCES:

1. Mastering Mobile Forensics by SoufianeTahiri, Packt Publishing, 1sted;2016
2. Computer Forensics: A Beginners Guide by David Cowen, McGraw Hill,1sted; 2013
3. Practical Digital Forensics Kindle Edition by Richard Boddington, PacktPublishing, 1st ed; July2016.
4. Learning Network Forensics by Samir Datt, Packt Publishing, 1sted;2016

OUTCOMES:

At the completion of this course students will be able to

• Demonstrate clear Understanding about technologies used in the field of cyber forensics .

- Analyze the duties of professionals employed at different levels cybercrime investigation
- Describe about storage devices & data recover methods

CAC 3123   **MACHINE LEARNING ALGORITHMS**   **L T P C**
                                                                                        3 0 0 3

OBJECTIVES

The objective of the course is to help students to

- Learn the basic concepts of statistical learning methods andmodels.
- Give the importance of supervised learning in multivariatedatasets.
- Understand the importance of supervised learning in classifying class labelsfor prediction.
- Understand the different algorithms related to classificationtechniques.

MODULE I   INTRODUCTIONTOMACHINELEARNING   9

Introduction to machine learning, types of learning, Learning Input-Output Functions, Designing a learning system, perspectives and issues in machine learning. Basic algorithms, Inferring Rudimentary Rules, Simple Probabilistic Modeling, Divide and Conquer: Constructing Decision Trees, Covering Algorithms: Constructing Rules, Mining Association Rules, Linear Models, Instance-based Learning, Clustering, Multi-InstanceLearning.

MODULE II   SUPERVISEDMACHINELEARNINGALGORITHMS   9

Supervised Machine Learning Algorithms, working principles of supervised machine learning algorithm, Naive Bayes algorithm, decision tree, Support Vector Machines, KNN, Random Forest algorithm.

MODULE III   UNSUPERVISEDMACHINELEARNINGALGORITHMS   9

Unsupervised Machine Learning Algorithms, working of unsupervised machine learning algorithm, clustering, neural networks, Blind Signal Separation Techniques like Principal Component Analysis, Singular Value Decomposition.

MODULE IV   REINFORCEMENTMACHINELEARNINGALGORITHMS   9

Reinforcement Machine Learning Algorithms, working of reinforcement machine learning algorithm, Finite Markov Decision Processes, Dynamic Programming, Monte Carlo Methods

MODULE V   USECASESANDIMPLEMENTATIONS   9

Machine learning in business, Use cases of machine learning implementation in various industry domains: Banking, Finance, Retail, Healthcare, Manufacturing, E-commerce, HumanResource.

TOTAL HOURS – 45

TEXT BOOKS:

1. Machine Learning by Tom M. Mitchell. 2014 Reprint.McGraw-HillScience
2. Data Mining: Practical Machine Learning Tools and Techniques by Ian HWitten, Eibe Frank, Mark A Hall, Christopher J Pal. Third Edition. Morgan Kaufmann Series in Data ManagementSystems,2016
3. Reinforcement Learning: An Introduction by Richard S Sutton and Andrew G.Barto. (2016).MITPress.

REFERENCES:

1. Understanding Machine Learning: From Theory To Algorithms by ShaiShalev- Shwartz(2015).
2. Simpler Using Machine Learning Algorithms in R by DarrinThomas(2017)

OUTCOMES:

At the completion of this course students will be able to

- Designing learning System
- Applying select supervised algorithms for the given model.
- Training the model with unsupervised algorithm
- Applying reinforcement machine learning algorithm
- Implement the system for a industry vertical

CAC3132   **GAMES ARTS AND DESIGN**   **L   T   P   C**
                                                                      3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Illustrate the concepts of game and designtechniques.
- Implement game programming techniques to solve game developmenttasks.
- Build familiarity and appreciation of the programmatic components of anindustry standard game development engine.
- Understand the basic mechanics and design structure of traditional and digital games.

MODULE I   **INTRODUCTIONTOGAMEPROGRAMMING**   **9**

Game Development, Dev C++ and Allegro, Basic 2D Graphics Programming with Allegro.

MODULEII   **GAMEPROGRAMMING**   **9**

Write your First Allegro Game, Programming the keyboard, mouse and Joystick.

MODULE III   **2DGAMETHEORY,DESIGN**   **9**

Introduction to Game Design, Basic Bitmap Handling and Blitting, Basic Sprite Programming: Drawing Scaled, Flipped, Rotated, and Pivoted

MODULE IV   **ADVANCEDSPRITEPROGRAMMING**   **9**

Advanced Sprite Programming: Animation, Compiled Sprites and Collision detection. Timers and Multi-Threading.

MODULE V   **CREATINGGAMEWORLD**   **9**

Editing tiles and levels, Vertical Scrolling Arcade Games, Horizontal Scrolling platform games.

                                                 TOTAL HOURS – 45

TEXT BOOKS

1. Jonathan S.Harbour,Game Programming all in one,2nd edition,2006.
2. Jesse Schell ,The Art of Game Design ,3rd Edition,2008.

REFERENCES

1. Tracy Fullerton, Game Design Workshop: A Play centric Approachto Creating InnovativeGames,Edition,2014.

Outcomes:

At the completion of this course students will be able to

- Explain the techniques in game programming and game engine architecture.
- Evaluate and select appropriate hardware and software platforms for a game.
- Design and create a computer game or game component.

TECHNOLOGY ELECTIVE– VII

CAC3115   **R PROGRAMMING**   **L   T   P   C**
                                               3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Understand the R programming environment and R StatisticalPackages.
- Know the functions in R and important points in Comments and commands.
- Understand the important programming concepts of R, class andobjects.
- Work with basic R commands, packages and accessing Rpackages

MODULE I   INTRODUCTION TO SCIENTIFIC PROGRAMMING   9

Introduction to scientific programming, R basics, code editors for R, finding help, control structures, conditional executions, loops.

MODULE II   FUNCTIONSAND COMMANDS   9

Functions in R, useful utilities, debugging utility, regular expressions, interpreting character string as expression, time-date-sleep, calling external software with system commands, running R commands.

MODULE III   OBJECTORIENTEDPROGRAMMINGINR   9

Object oriented programming in R, define class and objects in R, assign generics and methods.

MODULE IV   PACKAGESINR   9

Packages in R, installation process of various packages in R, data science packages in R, Building R packages.

MODULE V   USE CASES OF SCIENTIFICPROGRAMMINGUSINGR   9

Comparison of R with other scientific programming software, implementation of various industry use cases of scientific programming using R.

TOTAL HOURS – 45

TEXT BOOKS:

1. Mark Gardener, Beginning R: The Statistical Programming Language (2013).

2. Roger PengR Programming for Data Science (2016)

REFERENCES:

1. Grolemund, Garrett, Hands-On Programming withR(2014)
2. Garrett Wickham, Garrett Grolemund, R for DataScience(2017)

OUTCOMES:

At the completion of this course students will be able to

- Edit the simple programs and save for execution
- Debug the syntax errors.
- Design the class and object
- Install the various packages of R
- Implement a simple application for real time application in R

CAC3102   VIRTUALIZATION AND CLOUD SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of the course is to help students to,

- Provide knowledge about Servervirtualization
- Learn the deployment and management of virtualized servers, deploying desktop, application and networkvirtualization.
- Understand the basic concepts of Cloud DataSecurity.
- Provide the basics of virtualization and CloudSecurity.

MODULE I   INTRODUCTIONTOVIRTUALIZATION&CLOUD   9

Virtualization and Cloud computing concepts – private vs public cloud, IaaS, PaaS& SaaS concepts, Virtualization security concerns – hypervisor and host/ platform Security, Security communications between – guest instances, hosts and guests, security challenges and mitigation measures

MODULE II   CLOUD SECURITY   9

Cloud Security vulnerabilities and mitigating controls, top threats to Cloud security, mitigation through Cloud Controls Matrix

MODULE III   CLOUD TRUSTPROTOCOL&TRANSPARENCY   9

Introduction to Cloud Trust Protocol & Transparency, Cloud Trust Protocol and Transparency, Transparency as a Service, Privacy & Compliance aspects of Cloud, Cloud Trust 2.0, Security Content Automation Protocol, Case Study on building transparent cloud.

MODULE IV   CLOUDDATASECURITY   9

Lifecycle, storage architecture security, foundational principles and strategies, data masking, secure migration and traceability technologies, encryption for data at rest and data in transit, platform and software specific Cloud Security aspects

MODULE V   LEGAL ASPECTS IMPACTING CLOUD
                        SECURITY AND PRIVACY   9

Understanding legal challenges involved in Cloud, liability, copyright, data protection, IPR, data portability, inter-country legal frameworks, personal data protection and

privacy, data controller and processor, contracts, provider's insolvency risk

TOTAL HOURS - 45

TEXT BOOKS:
1. Virtualization Security: Protecting Virtualized Environments ByDaveShackleford, Sybex2012.
2. Openstack Cloud Security By Fabio Alessandro Locati, Packt PublishingLimited 2015.
3. Cloud Security – A Comprehensive Guide To Secure Cloud ComputingByRonaldL. KrutzAndRussel Dean Vines, Wiley, 2010.

REFERENCES:
1. Securing the Cloud: Cloud Computer Security Techniques and TacticsbyVic (J.R.) Winkler,Syngress2011.
2. Practical Cloud Security: A Cross-Industry View by Melvin B. Greer Jr., KevinL. Jackson CRC Press; 1edition2016.

OUTCOMES:
By the end of this course students will be able to,
- Realize the Virtualization security concerns and Cloud trustprotocol.
- Build a transparent cloud.
- Demonstrate a clear understanding of the basic concepts of Cloud Data Security.
- Identify the legal challengesimpacting cloud security.

CAC3133	XML AND WEB SERVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to,

- Understand the design rationale for web services in terms of objectives, trade- offs andalternatives.
- Learn the XML standards and schema
- Understand the architecture and design of the Web Servicesframework.
- Understand the semantic web and content managementframework.

MODULE I   XML TECHNOLOGYFAMILY   9

XML –benefits –Advantages of XML over HTML –EDL –Databases –XML based standards – DTD –XML Schemas –X- Files –XML processing –DOM –SAX- presentation technologies – XSL –XFORMS –XHTML –voice XML –Transformation –XSLT –XLINK–XPATH–XQ.

MODULE II   ARCHITECTINGWEB SERVICES   9

Business motivations for web services –B2B –B2C- Technical motivations – limitations of CORBA and DCOM –Service –oriented Architecture (SOA) – Architecting web services – Implementation view –web services technology stack – logical view – composition of web services –deployment view –from application server to peer topeer–process view –life in the run time

MODULE III   WEBSERVICESBUILDINGBLOCK   9

Transport protocols for web services –messaging with web services –protocols – SOAP–describing web services –WSDL –Anatomy of WSDL –manipulating WSDL – web service policy –Discovering web services –UDDI –Anatomy of UDDI- Web service inspection –Ad-Hoc Discovery –Securing web services.

MODULE IV   IMPLEMENTINGXMLINE-BUSINESS   9

B2B - B2C Applications –Different types of B2B interaction –Components of e-business XMLsystems –ebXML –Rosetta Net Applied XML in vertical industry –Web services for mobile devices.

MODULE V   XMLANDCONTENTMANAGEMENT   9

Semantic Web –Role of Meta data in web content –Resource Description Framework–RDF schema –Architecture of semantic web –content management workflow –XLANG–WSFL

TOTAL HOURS- 45

TEXT BOOKS

1. Ron schmelzer et al, "XML and Web Services", PearsonEducation,2002.
2. Sandeep Chatterjee and James Webber, "Developing Enterprise WebServices: An Architect's Guide", Prentice Hall,2004.

OUTCOMES:

At the completion of this course students will be able to

- Write well-formed XML documents
- Write the schema for the given XML documents in both DTD and XML Schema languages
- Format XML data to the desired format.
- Construct XML documents by using DOM.
- Create, deploy, and call Web services using Java, PHP and C.

TECHNOLOGY ELECTIVE –VIII

CAC3113   **PRINCIPLES OF VIRTUALIZATION**   **L   T   P   C**

                                                                      3   0   0   3

OBJECTIVES:

The objective of the course is to help students to:

- Understand the basic concepts ofVirtualization
- Explores the implementation and usage of VM Ware Virtualization, itsinstallation process and the working of Windows ServerhyperV.
- Deploying and managing an enterprise desktop virtualizationenvironment

MODULE I   BASICSOFVIRTUALIZATION   9

Understanding Virtualization, Need of Virtualization and Virtualization Technologies: Server Virtualization, Storage Virtualization, I/O Virtualization, Network Virtualization, Client Virtualization, Application virtualization, Desktop virtualization, Understanding Virtualization Uses: Studying Server Consolidation, Development and Test Environments , Helping with Disaster Recovery.

MODULE II   DESKTOPVIRTUALIZATIONENVIRONMENT   9

Configure the BIOS to support hardware virtualization; Install and configure Windows Virtual PC: installing Windows Virtual PC on various platforms (32-bit, 64-bit), creating and managing virtual hard disks, configuring virtual machine resources including network resources, preparing host machines; create, deploy, and maintainimages.

MODULE III   MANAGING A PRESENTATION VIRTUALIZATION
                             ENVIRONMENT   9

Prepare and manage remote applications: configuring application sharing, package applications for deployment by using RemoteApp, installing and configuring the RD Session Host Role Service on the server.

MODULE IV   ACCESSINGPUBLISHEDAPPLICATIONS   9

Access published applications: configuring Remote Desktop Web Access, configuring role-based application provisioning, and configuring Remote Desktop client connections. Configure client settings to access virtualized desktops: configuring client settings

MODULE V   UNDERSTANDINGVIRTUALIZATIONSOFTWARE   9

List of virtualization Software available .Vmware- introduction to Vsphere, ESXi, VCenter Server and Vsphere client. Creating Virtual Machine..Introduction to HYPER-V role. Create Virtual Machines. Create Hyper-v virtual networking, Use virtual Machine Snapshots.

TOTAL HOURS – 45

TEXT BOOKS:
1. WanGrotenhuis, Rogier,DittnerVirtualization with Microsoft Virtual Server,2005.
2. Aaron Tiensivu, Ken Majors, Geoffrey Green, David Rule, Andy Jones,MatthijsteSeldam, SyngressPublications,2006.

REFERENCES:
1. Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka Menken, Gerard Blokdijk, Lightning SourceIncorporated,2008
2. Virtualization: From the Desktop to the Enterprise, Chris Wolf, ErickM.Halter, EBook,2005

OUTCOMES:

At the completion of the course, students will be able to,
- Describe the basic concepts of Virtualization
- Explore the usage of VM Ware Virtualization
- Demonstrate clear understanding of installation and working of Window Server
- Analyze an enterprise desktop virtualization environment

CAC3109   **IOS APPLICATIONS**   **L   T   P   C**

3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

* Gain core skills on the framework of iOSdevelopment
* Create and manage iOS controls such as buttons, text fields, andpickers.
* Know mobile app paradigm, IOS components andservices.
* know controls and gestures, creating universal applications run on iPhoneand iPad

MODULE I   INTRODUCTIONTOIOS   9

Why IOS- Short History of IOS -Requirements for IOS- main characteristics of mobile apps - Differences between mobile apps and desktop apps- How iOS is tailored to a mobile platform

MODULE II   IOSARCHITECTURE   9

What is IOS -IOS Architecture -Frameworks -MVC Design Pattern -Application Life Cycle -Features- IOS components and services- IPhone architecture-COCOA touch classes-interfacebuilder

MODULE III   XCODE   9

Introduction to Xcode -- Navigator -- Editor -- Utility -- Tools -- Console -- Document - Simulator -Instruments -Window, View Controller & Views -Interface Builder - Compiler

MODULE IV   INTRODUCTION TOOBJECTIVECANDSWIFT   9

Introduction to Objective-C -General Concepts of Objective-C – Data Types in Objective C-Classes, Objects and Methods in Objective C-Memory Management - Introduction to Swift –Swift Environment-Data Types-Classes, objects and Methods in Swift.

MODULE V   APPLICATION DEVELOPMENTINIPHONE   9

Controls and Gestures-Advance controllers Programming-Navigation based Application development- create Universal applications that run on both iPhone and iPad-Core Animation- Core Graphics APIs to do simple drawing- Handle touch events- Create and present editable tables of data – using UI TableView-accessing

user photos and camera within an application.

TOTAL HOURS – 45

TEXT BOOKS:

1. Learning IoS Programming-3rd Edition,ORielly Publisher 2013.

REFERENCES:

1. www.developer.ios.com2.www.thenextweb.com

OUTCOMES:

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

- Identify the various requirement of IOS
- Explain the architecture of IOS
- Identify the role of XCode in IOS
- Write simple programs in IOS

CAC3121   **TIME SERIES ANALYSIS**   L   T   P   C
                                                        3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Understand the basic concepts of time seriesanalysis.
- Learn the time series models and model evaluationtechniques.
- Study   the integration process of non-stationarydataset.
- Understand the importance of ARMA and ARIMA models forforecasting.

MODULE I   INTRODUCTIONTOTIMESERIES   9

Introduction to Time Series: Definition, Examples, Components of time series, Trend, Seasonal, Cyclic and Irregular Variations, Determination of trend: Method of moving average, method of least squares, Determination of seasonality: Ratio to trend method, Ratio to moving average method, Exponential Smoothing: Simple exponential Smoothing, Holt Winter's Smoothing Procedure.

MODULE II   CORRELATIONAND FUNCTION   9

Stationarity, Auto covariance, Autocorrelation functions and its properties, Partial Autocorrelation function, Test for stationarity, Test for randomness, Spectral density Function.

MODULE III   MODELS OF TIMESERIES   9

Models of Time series: Autoregressive (AR) models, Moving average (MA) models, Properties such as stationarity, invertibility, ACF, PACF, Spectral density function.

MODULE IV   ANALYSISOFTIMESERIES   9

Box-Jenkins analysis of time series: Model identification using ACF and PACF, Estimation of parameters of AR, MA and ARMA models by method of MLE,method ofleast squares, fitting of the models, residual analysis and diagnostic checking. Autoregressive integrated moving average (ARIMA) models: Definition and elementary properties.

MODULE V   NON LINEAR TIMESERIESMODELS   9

Non Linear Time Series Models, ARCH and GARCH Models: definition and basic properties, Multivariate Time Series Models: Introduction, Stationary Multivariate Time Series, Vector Autoregressive Models, Vector ARMA Models, Co-integration.

TOTAL HOURS: 45

TEXT BOOKS:

1. C. Chatfield: The Analysis of Time Series - An Introduction Chapman andHall. 2003
2. G.E.P. Box, G.M. Jenkins and G.C. Reinsel: Time SeriesAnalysis,Forecasting and Control, John Wiley & SonsPublications.2008
3. P.J. Brockwell .and R.A. Davis: Time Series: Theory and Methods, Springer- Verlag.1991

REFERENCES:

1. Chris Brooks: Introductory Econometrics for Finance,CambridgeUniversity Press,2019
2. S.P. Gupta: Statistical Methods, Sultan, Chand &Sons.2011.

OUTCOMES:

At the completion of this course students will be able to

- Determine the trend of the time series data point
- Find the correlation between predictors
- Model the time series data with ACF and PACF.
- Design ARIMA models
- Implement Multivariate Time series system conceptually.

CAC3134	SPECIALIZATION IN3DPRODUCTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to,

- Learn the skills with key-frame animation and the students will alsolearn techniques for animating.
- Understand the basics of Modeling and Animationtechniques
- Gain the fundamental knowledge of VisualArts

MODULE I   BASICOFMODELINGANDINTERFACE   9

Basics of Modeling- Introduction of 3D software interface -Exploring the interface, Controlling the viewports, The Max Interface, Accessing commands in the menu bar

MODULE II   INTRODUCTION OF3DMAX   9

Introduction of 3d Max, Hardware & software requirements -, Introduction to 3D animation. Basic concepts of 3d studio max - The command panel, Navigating in view ports,Basics of Max, Selecting Objects and Using Layers

MODULE III   ANIMATIONKEYS   9

Working With The Max Animation Tool, Getting Started The Animation In Max, Using Controllers to Animate, Using The Track View To Animate, Creating Mat/Shadow Materials, Building Compound Materials, New Materials Features In R3 Camera Mapping Transforming Object.

MODULE IV   FUNDAMENTALSOFVISUALARTS   9

Understanding of Color Model, Editing Video Clips, Compositing Video Clips, Basic elements of Drawing -Introducing Modifiers- Fundamentals of Visual Arts -Drawing and Editing 2D Spines and Shapes Editing Spine Editing Segments.

MODULE V   PROCESSOF3DMODELING   9

Process of 3D Modeling –High resolution Modeling –Low resolution Modeling - Modeling with Polygon, Using Graphite Modeling tools

TOTAL HOURS: 45

TEXT BOOKS:

1. Lukas Dubeda, 3ds Max 2010 Architectural Visualization - Advanced to expert,2009.
2. Kelly L. Murdock, 3ds Max 2010 Bible Author PublisherWiley,2008
3. 3D Max Bible(April2006)

OUTCOMES:

At the completion of this course students will be able to

- Build 3D graphical scenes
- Use open graphics library suits.
- Implement image manipulation and enhancement.

PROGRAMME ELECTIVE- II

CACX55	HEALTH CARE ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES

The objective of the course is to help students to

- Learn about the basic concepts of health care system.
- Create and maintain health care informationsystems
- Gain knowledge about IT governance and assessment of health careinformation

MODULE I   INTRODUCTION   9

Introduction to health care information – Health care data quality – Health care information regulations, laws and standards.

MODULE II   HEALTHCAREINFORMATIONSYSTEMS   9

History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support.

MODULE III   INFORMATIONTECHNOLOGY   9

Information architecture and technologies that support health care information systemsHealth care information system standards – Security of health care information systems.

MODULE IV   MANAGEMENTOFITCHALLENGES   9

Organizing information technology services – IT alignment and strategic planning – IT governance and management.

MODULE V   ITINITIATIVES   9

Management's role in major IT initiatives – Assessing and achieving value in health care information systems. Case study

TOTAL HOURS: 45

TEXT BOOKS:

1. Karen A Wager, Frances Wickham Lee, John P Glaser, "Managing Health Care Information Systems: A Practical Approach for Health Care Executives", John Wiley 2ndedition2009.
2. Marion J. Ball, Charlotte Weaver, Joan Kiel,"Healthcare Information Management Systems: Cases, Strategies, and Solutions", Springer, 2010, 3 rd edition
3. Rudi Van De Velde and Patrice Degoulet, "Clinical Information Systems: A Component based approach",Springer2005.

REFERENCE BOOKS:

1. Kevin Beaver, Healthcare Information Systems, Second edition Best Practices, CRCPress,2002
2. 2. Marion J. Ball Healthcare Information Management Systems: A Practical Guide Springer-VerlagGmbH,1995

OUTCOMES:

On completion of this course, students will be able to

- Identify, analyze the computing requirements of a problem and Solvethem using computingprinciples.
- Design and Evaluate a computer based system, components and process to meet the specific needs ofapplications.
- Use current techniques and tools necessary for complex computingpractices.
- Use suitable architecture or platform on design and implementation with respect to performance Develop and integrate effectively system based components into userenvironment.
- Apply the understanding of management principles with computing knowledge to manage the projects in multidisciplinaryenvironments.

CACX56   **AGILEMETHODOLOGY**   **L   T   P   C**
                                                        3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Understand the important basic concepts of agilemethodology.
- Know the importance of agile values and principles.
- Understand the foundations of agile delivery methods and XP and AM.
- To know the agile project development phases and identifying scopeof agileproject.

MODULE I   INTRODUCTION   9

Introduction to Disciplined Agile Delivery, Context Counts--The Agile Scaling Model, Disciplined Agile Delivery (DAD) Process Framework, People First approach, Learning Oriented approach, A Hybrid Process Framework, Goal-Driven Delivery Lifecycle, Enterprise Aware .

MODULE II   AGILEPRINCIPLES   9

Introduction to Agile and Lean, Toward a Disciplined Agile Manifesto, Disciplined Agile Values, Disciplined Agile Principles, Lean Principles.

MODULE III   AGILEMODELING   9

Foundations of Disciplined Agile Delivery, the Terminology Tar Pit, Scrum, Extreme Programming (XP), Agile Modeling (AM), Agile Data, Lean Software Development.

MODULE IV   AGILEROLE   9

People first approach, Roles, Rights, and Responsibilities, The Rights of Everyone, The Responsibilities of Everyone, The DAD Roles, Forming Disciplined Agile Delivery Teams.

MODULE V   AGILEDELIVERY   9

Initiating a Disciplined Agile Delivery Project, the Inception Phase, Identifying a Project Vision, Identifying the Initial Scope, Identifying an Initial Technical Strategy, Initial Release Planning, Forming the Work Environment.

TOTAL HOURS: 45

TEXT BOOKS:

1. S.W. Ambler, M. Lines, Disciplined Agile Delivery: A Practitioner's GuidetoAgile Software Delivery in the Enterprise, IBMPress,2012.
2. K. Beck, Test Driven Development: By Example,Addison-Wesley,2002.
3. K. Beck, C. Andres, Extreme Programming Explained: EmbraceChange,2nd Edition, Addison-Wesley,2004.

REFERENCES:

1. M. Cohn, Succeeding with Agile: Software Development Using Scrum,Addison Wesley,2010.
2. K.S. Rubin, Essential Scrum: A Practical Guide to the Most PopularAgileProcess, Addison-Wesley,2012.

OUTCOMES:

After completing this course, students will be able to ,

- Describe agile software development methodologies and approaches.
- Identify the benefits and pitfalls of transition to agile.
- Apply various features and components of agile methodology in the field of data science.
- Analyze the teams rely less on up-front requirements and documentation than on face-to-
- face conversations.
- Identify the agile development accelerates the delivery of initial business value.

CACX57	HUMAN RESOURCES MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES

The objective of the course is to help students to,

- Understand about management issues related to staffing, training,performance, compensation,
- Understand human factors consideration and compliance with human resource requirements.
- Students will gain knowledge and skills needed for success as a human resourcesprofessional

MODULE I   PERSPECTIVES INHUMANRESOURCE MANAGEMENT   5

Evolution of human resource management – The importance of the human factor – Challenges – Inclusive growth and affirmative action -Role of human resource managerHuman resource policies – Computer applications in human resource management – Human resource accountingandaudit.

MODULE II   THE CONCEPT OFBESTFITEMPLOYEE   8

Importance of Human Resource Planning – Forecasting human resource requirement – matching supply and demand - Internal and External sources. Recruitment - Selection – induction – Socialization benefits.

MODULE III   TRAININGANDEXECUTIVEDEVELOPMENT   10

Types of training methods –purpose- benefits- resistance. Executive development programmes – Common practices - Benefits – Self development – Knowledge management.

MODULE IV   SUSTAININGEMPLOYEE INTEREST   12

Compensation plan – Reward – Motivation – Application of theories of motivation Career management – Development of mentor –Protégé relationships.

MODULE V   PERFORMANCE EVALUATION AND CONTROLPROCESS   10

Method of performance evaluation – Feedback – Industry practices. Promotion, Demotion, Transfer and Separation – Implication of job change. The control process

–Importance – Methods – Requirement of effective control systems grievances – CausesImplications – Redressalmethods.

TOTAL HOURS: 45

TEXTBOOKS

1. Dessler Human Resource Management, Pearson EducationLimited,2007
2. Decenzo and Robbins, Human Resource Management, Wiley, 8thEdition,2007.

REFERENCES

1. Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy.ManagingHuman Resource. PHILearning.2012
2. Bernadin, Human Resource Management,Tata McgrawHill ,8thedition2012.
3. Wayne Cascio, Managing Human Resource, McGrawHill,2007.
4. Ivancevich, Human Resource Management, McGrawHill2012.
5. Uday Kumar Haldar, Juthika Sarkar. Human Resourcemanagement.Oxford. 2012

OUTCOMES

After completing this course, students will be able to ,

- Describe Role of human resource manager Human resource policies
- Forecast human resource requirement
- Apply theories of motivation in Career management
- Implement Methods of performance evaluation

CACX58	EMPLOYABILITY SKILLS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the course is to help students to,

- Qualify themselves for employment to work in a corporate sector
- Gain technical knowledge and experience and interpersonal skillslike speaking skills.
- Acquire Professional etiquettes and so on.
- Everyday interactions with people, both in personal and professionallives.

MODULE I   SPEAKINGSKILLS   9

Group Discussions; Importance of Group Discussions; Difference between Group Discussion, Panel Discussion and Debate; Format of GD as used in national level recruitment boards, Rules, ambience and normal practices, Dos and Don'ts in Group Discussions, Traits Evaluated in GDs

MODULE II   MANNERISM   9

Introduction; Professional etiquette – Etiquette at meetings, Dining, Involuntary Awkward Actions; Technology Etiquette – Phone, Email, Social Media, Video Conferencing, Webinterview

MODULE III   PROFESSIONAL PRESENTATIONS   9

Nature of Oral Presentation; Planning a Presentation, Preparing the Presentation; Delivering the Presentation .

MODULE IV   INTERVIEWETIQUETTE   9

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews.

MODULE V   STRESSMANAGEMENT   9

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a longterm career plan-making career changes

TOTAL HOURS: 45

TEXT BOOKS:

1. Edgar Thorpe and Showick Thorpe Objective English: 3 rd Edition,Pearson Publishers,2010
2. Patsy Mc Carthy& Caroline Hatcher Presentation skills. The essentialguidefor students, Sagepublications,2002.

REFERENCES:

1. Gajendra Singh Chauhan &SangeetaSharma Soft Skills – An integrated approach to Maximize Personality, WileyPublications2011

OUTCOMES:

At the completion of this course students will be able to

- Explore their values and career choices through individual skill assessments
- Develop and practice self management skills for the work site
- Explore and practice basic communication skills
- Learn skills for discussing and resolving problems on the work site
- Assess and improve personal grooming

TECHNOLOGY ELECTIVE LAB II

CAC3107	COMPUTER FORENSICS AND	L	T	P	C
	INVESTIGATIONLABORATORY	0	0	4	2

OBJECTIVES

The objective of the course is to help students to,

- Provide practical experience how to perform a forensic investigation,collect evidences according to thestandards
- Analyze the different operating system, their file architecture and to retrievedata that in a forensically soundmanner.

LIST OF EXPERIMENTS:

1. A carder has ordered products using hacked credit cards and he tried to be anonymous by using VPN, TOR etc. You have received a cyber complaint regarding such scenario. As a computer forensic expert, demonstrate the ways to collect electronic evidence using forensicstandards.

2. Dismantling and re-building PCs in order to access the storage mediasafely

3. Boot sequence and Power on Self -Test modeanalysis

4. Being a forensic analyst you have been given an assignment to examine the files present in the systems which was ceased in the crime scene that operates in different platform such as Windows and Linux. Examine the files and the file systems of each platform.

5. Analyzing Word processing and Graphic file format

6. An attacker has got the access to the network of an organization by performing war divingattackandcompromised critical asset ofthecompany.Asaforensicinvestigatorfind how the attacker would sniffed the network, also analyse the network packets which was compromised.

7. Password and encryptiontechniques

8. There was an cyber-attack on our university, where a malicious file spread through the network and compromised every system by encrypting each files present inside the system. Investigate the case and generate a report by analyzing the malicious file and the network data.

9. An cyber expert took over an system by exploiting the vulnerability in it. Once the attacker took the data he needed and wiped the entire hard disk as a clean slate. Being a forensic investigator demonstrates how to cease

the system and its parts, also analyse the external drive by recovering thedata.

10. Data recovery techniques for Pen drive andCD
11. Create a scenario based on real timedomain.
12. Create a scenario based on real timedomain.

TOTAL HOURS -60

OUTCOMES:

At the completion of the course, students will be able to

- Know the standards they have to follow in order to collect evidences fromthe cybercrimescene.
- Examine malicious files, logs of different operating system in a forensicallysound manner.
- Analyze any kind of malicious file and also recover wiped data from any type of externaldrives.

CAC3124 MACHINE LEARNINGALGORITHMSLABORATORY

	L	T	P	C
	0	0	4	2

OBJECTIVES:

The objective of the course is to help students to,

* Learn, understand and practice machine learningapproaches.
* provide hands-on exposure to various machine learning algorithms usedin business environment
* Understand the basic concepts of decision treealgorithms.

LIST OF PROGRAMS:

1. Implement Decision Tree algorithm in a given business environment and comment on its efficiency and performance.
2. Explore and implement Naive Bayes algorithm in a given business scenarioand comment on its efficiency andperformance.
3. Explore and implement SVM algorithm in a given business scenario and comment on its efficiency andperformance.
4. Explore and implement SVD algorithm in a given business scenario and commenton its efficiency andperformance.
5. Explore and implement Random Forest algorithm in a given business scenarioand comment on its efficiency andperformance.
6. Explore and implement PCA algorithm in a given business scenario and commenton its efficiency andperformance.
7. Explore and implement KNN algorithm in a given business scenario and commenton its efficiency andperformance.
8. Explore and implement Clustering algorithm in a given business scenario and comment on its efficiency andperformance.
9. Explore and implement Neural Network algorithm in a given business scenarioand comment on its efficiency andperformance.
10. Compare and contrast all supervised learning machine algorithms explored inexpt #1 to 5.

Case Study 1

Machine Learning Algorithms – Algae an Environmental Study

High concentrations of certain harmful algae in rivers constitute a serious ecological problem with a strong impact not only on river life forms, but also on

water quality. Being able to monitor and perform an early forecast of algae blooms is essential to improving the quality of rivers. With the goal of addressing this prediction problem, several water samples were collected in different European rivers at different times during a period of approximately 1 year. For each water sample, different chemical properties were measured as well as the frequency of occurrence of seven harmful algae. Some other characteristics of the water collection process were also stored, such as the season of the year, the river size, and the river speed.

One of the main motivations behind this application lies in the fact that chemical monitoring is cheap and easily automated, while the biological analysis of the samples to identify the algae that are present in the water involves microscopic examination, requires trained manpower, and is therefore both expensive and slow. As such, obtaining models that are able to accurately predict the algae frequencies based on chemical properties would facilitate the creation of cheap and automated systems for monitoring harmful algae blooms. Another objective of this study is to provide a better understanding of the factors influencing the algae frequencies. Namely, we want to understand how these frequencies are related to certain chemical attributes of water samples as well as other characteristics of the samples (like season of the year, type of river, etc.). The data available for this problem was collected in the context of the ERUDIT1 research Network and used in the COIL 1999 international data analysis competition. It is available from several sources, such as in the UCI Machine Learning Repository of data sets.2 There are two main datasets for this problem.The first consists of data for 200 water samples. To be more precise, each observation in the available datasets is in effect an aggregation of several water samples collected from the same river over a period of 3 months, during the same season of the year. Each observation contains information on 11 variables. Three of these variables are nominal and describe the season of the year when the water samples to be aggregated were collected, as well as the size and speed of the river in question. The eight remaining variables are values of different chemical parameters measured in the water samples forming theaggregation

Exercises

1. Fit the appropriate predictivemodel.
2. Test the significance of predictive model using Global Ftest
3. Test the significance of predictive model using Partial ttest

4. Compare and conclude using Global F test and partial t test.

5. Test the auto correlation using Durbin Watson Test statistics and comment onthe test.

TOTAL HOURS - 60

REFERENCES:

1. Understanding Machine Learning: From Theory To Algorithms by ShaiShalev-Shwartz(2015).

2. Simpler Using Machine Learning Algorithms in R by Darrin Thomas(2017

OUTCOMES

At the completion of the course, students will be able to,

- Select and implement machine learning techniques and computingenvironment that are suitable for the applications underconsideration.

- Implement various ways of selecting suitable model parameters fordifferent machine learningtechniques.

- Understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

CAC3135	ANIMATIONLABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

The objective of the course is to help studentsto,

- Build skills to createanimation.
- Apply Concept in animationart-making.
- Develop awareness of current animation practices through diverse examplesof animation, films, videogames,art,etc.

LIST OF PROGRAMS

1. BallAnimation
2. Character Motion Animation
3. Short RenderedAnimation
4. Drawing Basic Objects in Adobe Flash
5. Drawing Basic Scenes in AdobeFlash
6. Creating Advancedkeyposes
7. Creating In-betweenKeyposes
8. Animating OrganicObjects
9. Creating Effect inAdobeFlash
10. Rendering Some Animation Scenes in AdobeFlash
11. Creating AtmosphericEffects
12. Creating various types ofRendering
13. Creating BasicRigging
14. Adding a background image to schematicview
15. Animating inorganicObjects

TOTAL HOURS - 60

TEXT BOOKS

1. Kelly L. Murdock, 3ds Max 2010 Bible Author PublisherWiley,2008

OUTCOMES:

At the completion of the course, students will be able to,

- Understand what Flash is and what you can do withit.
- Create and Edit Symbols.
- Creating BasicRigging
- Animating inorganicObjects

TECHNOLOGY ELECTIVE LAB III

CAC3156	RPROGRAMMINGLABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

The objective of the course is to help students to ,

- Provide students a hands-on exposure to scientific programming usingR.
- Provide wider knowledge to know about data structures in R and itstypes.
- Know about the statistical modeling with real timedata.
- Know the customized graphical techniques in R using inbuilt graphpackages.

LIST OF PROGRAMS:

1. Install and configure R, set workingdirectory.
2. Implement basic R operations (data input, missing values, importing data intoR)
3. Use R as a calculator
4. Explore various functionalities of dataframes
5. Explore various functionalities of plots
6. Formal data exploration inR
7. Data summary inR
8. Sampling distribution and central limit theorem inR
9. Linear regression model in R
10. Data visualization using ggplots inR.
11. Create a scenario based on real timedomain

Case Study - 1

Scientific Programming using R Lab

The air pollution is one of the main causes of serious respiratory problem in the world especially difficulty in breathing in asthmatic patients. Several cities are on the radar of WHO (World Health Organization), which are about to touch the dangerous level. Sadly, India is one of the countries with maximum number of most polluted cities in the world.

Especially, on the onset of Diwali, the air quality index of Chennai soars to new heights. This year the air quality index has already crossed last year's post Diwali index.

To know the intricacies of the problem, we decided to do an analytical study for the factors that contribute most to air pollution in Chennai.

In this article, we share a case study on "Identifying Patterns in Chennai's Air Pollution", in which we closely studied the air quality data for Chennai, identified patterns, factors that lead to rise in air pollution across three key locations in Chennai. On this occasion of Diwali, we want to sensitize the readers towards celebrating environmentally safe Diwali this year.The rate at which urban air pollution has grown across India is alarming. A vast majority of cities are caught in the toxic web as air quality fails to meet health- based standards. Almost all cities are reeling under severe particulate pollution while newer pollutants like oxides of nitrogen and air toxics have begun to add to the public health challenge. According to WHO, India ranks among the world's most polluted countries. Out of the 20 most polluted cities in the world, 13 are in India. In which, Chennai is the one among the most polluted city inIndia today.

Exposure to particulate matter for a long time can lead to respiratory and cardiovascular diseases such as asthma, bronchitis, lung cancer and heart attack. Last year, the Global Burden of Disease study pinned outdoor air pollution as the fifth largest killer in India, after high blood pressure, indoor air pollution, tobacco smoking, and poor nutrition. In 2010, about 620,000 early deaths in India occurred from air pollution-related diseases. The Central Pollution Control Board (CPCB) sponsored the study that links thepollutants,pm10(particulatemattersmallerthan10microns),thecauseofthesedise ases. The central regulatory authority recently regulated stricter norms for a number of air toxins and pollutants but omitted revision of the standard for pm 10.

We feel, if we closely study the Air Quality Data, we should be able to identify patterns (spike in air pollution levels) and identify correlating factors on key levels of Air Pollution across Chennai. Also as part of the exercise, we wanted to study the impact of Government sponsored Initiatives like 'Odd-Even' Pilot Project Phase II. The Phase I of the 'Odd- Even' experiment was a huge success in terms of people compliance and reduction of traffic congestion; it had very little impact on the Air Pollution levels during the Campaign period.It is also important to understand the behaviour of meteorological parameters in the planetary boundary layer because, atmosphere is the medium in which air pollutants are transported away from the source, which is governed by the meteorological parameters such as atmospheric wind speed, wind direction, and

temperature.Air pollutants are being let out into the atmosphere from a variety of sources, and the concentration of pollutants in the ambient air depends not only on the quantities that are emitted but also the ability of the atmosphere, either to absorb or disperse these pollutants.There were conflicting reports in media on the actual cause of air pollution in Chennai. Some sections claimed vehicles as the main source of pollution, while others held road dust & construction debris responsible. But the root cause of the problem is Industrialpollution.

Through this study, we hope to develop some insights that can help organizations (State / Central Pollution Control Boards & NGOs) to advocate more stringent policies to control airpollution.

- Study Air Pollution Data for various locations in Chennai to identify patternsof spike in Air Pollution levels w.r.t to various monitoredparameters
- Identify the Meteorological factors that correlate with the air pollution levelsfor the respective locations usingRFunctions
- Explore the possibility of developing a Predictive Model for predicting thelevels for key pollutants like PM 5 using suitable R predictivemodel.
- Explore the factors which most impact on air pollution PM 5 using R PCA analysis and FactorAnalysis.

Case Study - 2

Scientific Programming using R Lab

High concentrations of certain harmful algae in rivers constitute a serious ecological problem with a strong impact not only on river life forms, but also on water quality. Being able to monitor and perform an early forecast of algae blooms is essential to improving the quality of rivers.

With the goal of addressing this prediction problem, several water samples were collected in different European rivers at different times during a period of approximately 1 year. For each water sample, different chemical properties were measured as well as the frequency of occurrence of seven harmful algae. Some other characteristics of the water collection process were also stored, such as the season of the year, the river size, and the river speed.

One of the main motivations behind this application lies in the fact that chemical monitoring is cheap and easily automated, while the biological analysis of the samples to identify the algae that are present in the water involves microscopic examination, requires trained manpower, and is therefore both expensive and slow. As such, obtaining models that are able to accurately predict the algae frequencies based on chemical properties would facilitate the creation of cheap

and automated systems for monitoring harmful algaeblooms.

Another objective of this study is to provide a better understanding of the factors influencing the algae frequencies. Namely, we want to understand how these frequencies are related to certain chemical attributes of water samples as well as other characteristics of the samples (like season of the year, type of river, etc.).

The data available for this problem was collected in the context of the ERUDIT1 research Network and used in the COIL 1999 international data analysis competition. It is available from several sources, such as in the UCI Machine Learning Repository of data sets.2 There are two main datasets for this problem. The first consists of data for 200 water samples. To be more precise, each observation in the available datasets isineffect an aggregation of several water samples collected from the same river over a period of 3 months, during the same season of the year. Each observation contains information on 11 variables. Three of these variables are nominal and describe the season of the year when the water samples to be aggregated were collected, as well as the size and speed of the river in question. The eight remaining variables are values of different chemical parameters measured in the water samples forming the aggregation.

Exercises:

1. Load the Data intoR
2. Visualize and summarize data andinterpret
3. Find Data normalityassumptions
4. Remove the Observations with UnknownValues
5. Fill in the Unknowns with the Most FrequentValues
6. Fill in the Unknown Values by Exploring Correlations
7. Fill in the Unknown Values by Exploring Similarities betweenCases

TOTAL HOURS –60

REFERENCES:

1. Grolemund, Garrett, Hands-On Programming with R(2014)
2. Garrett Wickham, Garrett Grolemund, R for Data Science(2017)

OUTCOMES:

After completing this lab, students will be able to,

- Work on R, use its features in the field of datascience.
- Understand the statistical model building and posttesting.
- Understand the graphical techniques inR.

CAC3114   **VIRTUALIZATION LABORATORY**   L   T   P   C

                                                       0   0   4   2

OBJECTIVES:

The objective of the course is to help students to

- Provide practical experience to students and reinforce deploying andmanaging an enterprise desktop virtualizationenvironment
- Explore the implementation and usage of VMWare Virtualization, its installation process and the working of Windows ServerhyperV.
- Understand the concepts of virtualizationtechniques.

LIST OF EXPERIMENTS

1. Installation and configuration of VmwareESXi server 6.5- a type-1 hypervisoron host machine to deploy a virtualmachine.
2. Installation and deployment of VmwarevCenter in a virtual machine that runson anESXihost.
3. Creation of Virtual Machines using vCenter server on a machine that hasaccess to ESXi host by installing Vsphereclient.
4. Modify Virtual Machine settings by adjusting the configuration like hardware, adding new virtual hard disk, number of virtual processor and memorysettings.
5. Using VMware Workstation, create a copy of virtual machine(clone) includingall its settings, configured virtual devices and virtual machine diskcontents.
6. Create a scenario based on real timedomain.

TOTAL HOURS – 60

TEXT BOOKS:

i. Aaron Tiensivu, Ken Majors, Geoffrey Green, David Rule, Andy Jones, MatthijsteSeldam, Syngress Publications, 2006.

REFERENCES:

1. Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka   Menken, Gerard Blokdijk, Lightning Source Incorporated, 2008
2. Virtualization: From the Desktop to the Enterprise, Chris Wolf, Erick M. Halter, EBook, 2005

OUTCOMES:

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

- Know about VMware Workstation Pro and virtualization software like V sphere ESXi, vCenter server and Vsphere client, learn to install and configure them.
- Work on hypervisor and its role invirtualization.
- Deploy virtual machines, create virtual hard disks, configure virtualmachine resources.

CAC3110   **IOS LABORATORY**   **L   T   P   C**
                                           0   0   4   2

OBJECTIVES:

The objective of the course is to help students to:,

- Understand the mobile programming aspects, design andimplementation
- Develop mobile applications for the ios operating system using basic and advanced phonefeatures.
- Deploy applications to the ios marketplace fordistribution

LIST OF EXERCISES:

1. DisplayHelloWorld.
2. Add two Edit Text. When a number is entered in Edit Text 1, the squareof that number should be displayed in EditText2.
3. Add an Edit Text and a button. When the button is clicked, the textinputted in Edit Text should be retrieved and displayed back totheuser.
4. Add two Edit Text and a button. When the button is clicked, the text inputted in Edit Text 1 should be retrieved and displayed in EditText2.
5. Program acalculator.
6. Create a MODULE convertor forheight.
7. Create a MODULE convertor for height and weight in the same application.Selection of height/weight can be done using aspinner.
8. Add a spinner. When the spinner is selected, there should be three options (e.g., android, java, testing). When you click on each option, itshould go to another page containing some other components. Each of these pages should have a "back" button, which on pressing will take you back to the page with thespinner.
9. Create applications to include Action Bar, Menus, Dialogs andNotifications
10. Create a user login form and registration form. First time users have to register through the registration form and the details should be stored in the database. Then they can login using the loginpage.
11. Create a camera application, where you can click a picture and then save it as the wallpaper.
12. Create a media player which plays anmp3song.

13. Create a media recorder which will record thesound.
14. Testingapplications.

TOTAL HOURS – 60

REFERENCES:

1. Learning IOs Programming-3rd Edition, O Reilly Publisher 2013
2. The Core IOs Developers Cookbook-Erica Sadon, Fifth Edition

OUTCOMES:

At the end of the course, the student should be able to:

- Understand and write IOSprograms
- Develop mobile applications for the ios operating system using basic and advanced phonefeatures.

CAC3136   XML ANDWEBSERVICESLABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

The objective of the course is to help students to ,

* Understand the design rationale for web services interms
* Understand the architecture and design of the Web Serviceframework.

LIST OF PROGRAMS

2. Create an XML document to store an addressbook.
3. Create an XML document to store information about books and create the DTDfiles.
4. Create an XML schema for the book's XML document fromexercise2.
5. Create an XML document to store resumes for a job web site and create the DTDfile
6. Present the book's XML document using cascading stylesheets(CSS).
7. Write an XSLT program to extract book titles, authors, publications, book ratingfrom the book's XML document and use formatting.
8. Use Microsoft DOM to navigate and extract information from the book's XML document.
9. Use Microsoft DSO to connect HTML form or VB form to the book's XML document and display theinformation.
10.   Create a web service for temperature conversion with appropriate clientprogram.
11. Create a web service for currency conversion (at five currencies) withappropriate clientprogram.

TOTAL HOURS – 60

REFERENCES:

1. Ron Schmelzer et al, "XML and Web Services", PearsonEducation, 2002.
2. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.

OUTCOMES

At the end of the course, the student should be able to,

* Understand and write well-formed XML documents
* Write the schema for the given XML documents in both DTD and XMLSchema
* Format XMLdata to the desiredformat

TECHNOLOGY ELECTIVE IX

CAC3203   **IT GOVERNANCE, RISK AND INFORMATION**   **L   T   P   C**
                           SECURITY MANAGEMENT   **3   0   0   3**

OBJECTIVES:

The objective of the course is to help students to ,

* Understand the importance of IT Governances and the best practices followed by the role of Steering committee and Chief Information Security Officer.
* Learn Risk management and the Information Security Management Practices including Hiring, Training, Promotion, Performance Evaluation etc.
* Gain knowledge of security practices

MODULE I   **IT GOVERNANCE**   **9**

Introduction & Concepts, Origin of Governance, Corporate Governance, Best Practices for IT Governance, Role of Governance in Information Security, Six outcomes of effective Security Governance, benefits of good governance, Cultural aspects in governance

.

MODULE II   **IT GOVERNANCE ROLES AND RESPONSIBILITIES**   **9**

IT Governance-Roles and Responsibilities, Role of IT Strategy Committee and Security Steering Committee, Standard IT Balanced Scorecard. Val-IT framework of ISACA, Governance in multi-department and multi-country enterprises, Importance of Governance in establishing a sustainable Security Culture in the organization .

MODULE III   **INFORMATION SYSTEMS STRATEGY**   **9**

Role of Strategic Planning for IT, Strategic Direction and Alignment of Security Strategy with Business Objectives, Role of CISO, Security Metrics Program.

MODULE IV   **RISK MANAGEMENT PROGRAM**   **9**

Develop a Risk Management Program. Risk Management Process, Roles and Responsibilities, Risk-IT Framework of ISACA, Strategic Security decisioning using Risk Management.

MODULE V   **INFORMATION SECURITY MANAGEMENT**   **9**

Introduction, Performance Optimization, Management Information Security Forum,

Segregation of Duties, Description of COBIT and other Frameworks, Security Program Effectiveness, Continuous Assessment and Improvement, In-sourcing versus Out- sourcing, Impact of ISM program across organization

TOTAL HOURS - 45

TEXT BOOKS:

1. Information Security Governance by S.H. Solms, RossouwSolms, Springer; 1st Edition. 2nd Printing, 2008edition.
2. IT Governance: How Top Performers Manage IT Decision Rights for Superior Results by Weill, Harvard Business Review Press; Firstedition2004.

REFERENCES:

1. Managing Risk and Information Security by Malcolm Harkins, Apress; 1 edition, 2012
2. IT Governance: An International Guide to Data Security and ISO27001/ISO27002 by Alan Calder, Steve Watkins, Kogan Page; 6 edition (3 September 2015)
3. Information Security Governance: Guidance for Information Security Managers by W. KragBrotby and IT Governance Institute, Isaca (2June2008)
4. Governance of Enterprise IT Based on COBIT 5: A Management Guide by Geoff Harmer (Author), IT Governance Publishing, (6February2014)

OUTCOMES:

On completion of the Project, students will be able to

- Apply the practical knowledge to solve real time applications
- Describe real time problem / research project scopes, objectives and deliverables.
- Design fundamental unified modeling language diagrams covering all modules of the project.
- Code effective programs to develop user interface design, processing logic and generate reports.
- Implement software/ electronic hardware by learning required testing and troubleshooting tools.
- Demonstrate the working project to the end user with consolidated project report.

CAC3222   DATA SCIENCE PROJECT MANAGEMENT   L   T   P   C
                                                        3   0   0   3

OBJECTIVES:

The objective of the course is to help students to,

- Understand and learn various project management lifecycles.
- Understand the difference between ETL and Data Science model.
- Know the important software for data science analysis.
- Learn data visualization techniques in analytics reports

MODULE I   PROJECT MANAGEMENT LIFECYCLE   9

Introduction to project management, various project management life cycles, SDLC, waterfall model, various aspects of managing a data science project.

MODULE II   MODELLING DATA SCIENCE PROJECT   9

Comparison of ETL project Vs Data Science, modelling data science project. Managing structured, unstructured and semi-structured data for data science project.

MODULE III   ANALYTICS TOOLS   9

Analytics tools for data science project, comparing open source and proprietary tools.

MODULE IV   DATA VISUALIZATION   9

Choosing a proper data visualization tool for data science project. Working with open source tools for data visualization.

MODULE V   REPORT GENERATION   9

Various stake holders of data science project, preparing project report for CXO level people. Report presentation and closure activities of a data science project.

TOTAL HOURS: 45

TEXT BOOKS:

1. SewerynSpalek, Data Analytics in Project Management, CRC Press (2018).
2. Field Cady, The Data Science Handbook, John Wiley &Sons(2017)

REFERENCES:

1. Sinan Ozdemir, Principles of Data Science, Packt Publishing Ltd(2016).

OUTCOMES:

After completing this course, students will be able to

- Design the Data science Project as per Industry standards and collect the data pertaining to the Software Requirement specifications.
- Extract,Transform and Load the Collected dataset to the ecosystem.
- Compare the open source andproprietary tools and select the appropriate tool for the
- project
- Visualize the complex data structure and correlation between predictors.
- Build Decision support system and generate reports.

CAC3231   **WEB AND E-BUSINESS**   **L   T   P   C**
                                                   3   0   0   3

OBJECTIVES

The objective of the course is to help students to,

- Learn the e-business strategy and E-commerce concepts
- Understand the Governing structure of E-Business
- Gain knowledge about the Infrastructure for E-Markets
- Gain Knowledge on procurement and value systems

MODULE I   E-BUSINESS STRATEGY   9

The world of E-Business, e-Business Strategy, Different types of Ecommerce, Advantages and disadvantages of ecommerce-Electronic Commerce and Opportunities: Background The Electronic Commerce Environment – Electronic Marketplace Technologies – Modes of Electronic Commerce: Overview : Electronic Data Interchange.

MODULE II   BUSINESS MODELS   9

Business Models, e-Business relationships, e-business strategy, e- business Framework, e-products and services- classifications of e- business- price formation process- comparison and valuation of networks.

MODULE III   E-BUSINESS TECHNOLOGICAL INFRASRUCTURE   9

Governance Structure, e-Business Technological Infrastructure, E-Markets- Online Payment – E-Security – Security Protocols – How sites are hacked – Internet Governance – Firewall Legal Issues: Software Intellectual Property Law – Contract Law for E-Business – Cyber Law Issues – Interpol

MODULE IV   E-BUSINESS NETWORKS   9

E-Procurements, e-Business Networks, Intermediaries in the value systems- strategic and operational procurement- information support for procurement- basic types of procurement solutions- market for e-procurement service provider.

MODULE V   E-BUSINESSINTEGRATION   9

E-business modeling, Security and reliability fora e-Business, e-business integration. Business Model – E-Marketing – Intelligent Agents – Economics in Ecommerce – Equilibrium price – Supply Chain Management.

TOTAL HOURS: 45

TEXT BOOKS

1. EfraimTurbain, Decision Support and Export System – Prentice Hall International Edition, EnglewoodClifts,1995.
2. Janakiraman and Sarukesi, Business Support System – Prentice Hall of India Pvt. Ltd, NewDelhi1999.
3. Lofti, E-Business Technology and Management Decision and Management – McGraw Hill Inc, International Edition, NewDelhi1996.
4. Maraks, E-Business Technology and Management – Prentice Hall International Paperback Edition, Delhi, 1998. 5. V.S. Janakriaman K. Sarukesi – E-Business Technology and Managements Prentice Hall ofIndia2002.

REFERENCES

1. Chaffey, D., E-Business and E-Commerce Management, 3rd Edition, Pearson, 2009.
2. Joseph, P.T., E-Commerce: An Indian Perspective, 4thEdition,PHI,2012.

OUTCOMES

- Demonstrate an understanding of the foundations and importance of E-commerce
- Demonstrate an understanding of retailing inE-commerce
- Analyze the impact of E-commerce on business models and strategy
- Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.
- Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other.