B.Sc. COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus

Regular (2021 – 2022)

Enable | Enlighten | Enrich
KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF ARTS, SCIENCE AND HUMANITIES

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act, 1956)

Eachanari (Post), Coimbatore – 641 021.
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FACULTY OF ARTS, SCIENCE AND HUMANITIES

UNDER – GRADUATE PROGRAMMES

(REGULAR PROGRAMME)

REGULATIONS
(2021)

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FACULTY OF ARTS, SCIENCE AND HUMANITIES
UNDER-GRADUATE PROGRAMMES
REGULAR MODE
REGULATIONS - 2021

The following Regulations are effective from the academic year 2021-2022 and are applicable to candidates admitted to Under Graduate Degree (UG) programmes in the Faculty of Arts, Science, and Humanities, Karpagam Academy of Higher Education (KAHE) from the academic year 2021-2022 onwards.

1 PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

1.1 U.G. Programmes Offered

A candidate may undergo a programme in any one of the under graduate programme approved by the KAHE as given below.

S. No.	DEGREE	DISCIPLINE
1	B. Sc.	Biochemistry
2	B. Sc.	Biotechnology
3	B. Sc.	Computer Science
4	B.Sc.	Mathematics
5	B.Sc.	Physics
6	B. Sc.	Chemistry
7	B. Sc.	Microbiology
8	B. Sc.	Information Technology
9	B. Sc.	Computer Technology
10	B.Sc.	Computer Science (Cognitive Systems)
11	B.Sc.	Computer Science (Artificial Intelligence and Data Science)
12	BCA	Computer Application
13	B.Sc.	Applied Science (Material Science)
14	B.Sc.	Applied Science (Foundry Science)
15	B. Com.	Commerce
16	B.Com (CA)	Commerce with Computer Applications
17	B. Com. (PA)	Commerce with Professional Accounting
18	B. Com. (BPS)	Commerce with Business Process Services

19	B.B.A.	Business Administration
20	B. Com	Financial Analytics
21	B. Com	International Accounting and Finance

1.2 Mode of Study

Full-Time

All programs are offered under Full-Time Regular mode. Candidates admitted under '**Full-Time'** should be present in the KAHE during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

1.3 Admission Requirements (Eligibility)

A candidate for admission to the first year of the UG Degree programme shall be required to have passed the Higher Secondary Examination (10 + 2) [Academic or Vocational] prescribed by the Government of Tamil Nadu Board or any similar examination of any other Board accepted by the KAHE as equivalent thereto.(Annexure I)

2. DURATION OF THE PROGRAMMES

2.1 The minimum and maximum period for the completion of the U.G. Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
B.Sc., B.Com, BCA, BBA	6	12

2.2 Each semester normally consists of 90 working days or 450 Instructional hours of study. Examination shall be conducted at the end of every semester for the respective courses.

3. CHOICE BASED CREDIT SYSTEM

3.1. All programmes are offered under Choice Based Credit System with a total credit of 140 for UG Programmes.

3.2. Credits

Credit means the weightage given to each course by the experts of the Board of Studies concerned. Total credits 140 as per UGC Guidelines for the UG programme (Three Years).

4. STRUCTURE OF THE PROGRAMME

4.1 Tamil or any one of the Indian / Foreign Languages *viz,* Malayalam,

Hindi, Sanskrit, French are offered as an additional course for Arts & Science Programmes. Four credits are awarded for each course and the examinations will be conducted at the end of each semester.

4.2. Core Course, Discipline Specific Elective, Generic Elective, Skill Enhancement Course, Project, Ability Enhancement Course are part of curricular structure.

4.2.1. Core Course

Core course consists of theory and practical for Department domains for which examinations shall be conducted at the end of each semester. The students have to study 12 Core Courses compulsorily. Students have to earn 62 Credits in Core Course.

4.2.2. Discipline Specific Electives (DSE)

DSE is offered in the fifth and sixth semesters of third year. The examination shall be conducted at the end of each semester. Final year students (V and VI Semesters) will have to choose the elective courses in V semester and VI Semester from the list of elective courses given in the curriculum, in addition to the project work. Students have to earn 26 Credits in Discipline Specific Electives.

4.2.3. Generic Elective

Generic elective is an elective course chosen generally from an unrelated discipline/subject, with an intention to provide exposure in other areas of interest also to students.

The students have to choose two Generic Electives- one each in the First year (3 or 4 courses) and second year (3 or 4 courses) of the programme from the list of elective courses given in the curriculum.

Note: A particular elective course will be offered only if at least one third of the students in a class choose that course. If less, the elective selected has to be studied as a self-study course only. Students have to earn 19 Credits in Generic Elective and 25 Credits in Allied Courses.

4.2.4. Skill Enhancement Courses

Skill Enhancement Courses are offered in the third and fourth semesters of second year programme and in the fifth and sixth semesters of the third year programme. Second year students (III and IV Semesters) will have to choose atleast one elective course each in both III and IV Semesters from the list of elective courses given in the curriculum. Similarly final year students (V and VI Semesters) will

have to choose at least one elective course each in both V and VI Semesters from the list of elective courses given in the curriculum. The examination shall be conducted at the end of each semester. Students have to earn 8 Credits in Skill Enhancement Courses.

Note: A particular elective course will be offered only if at least one third of the students in a class choose that course. If less, the elective selected has to be studied as a self-study course only.

4.2.5. Project Work

The project work shall start at the beginning of sixth semester and the Project Report has to be submitted at the end of the sixth semester. The project may be an individual or group task**.** The Head of Department concerned shall assign a project supervisor who in turn shall monitor the project work of the student(s). A project/ dissertation work may be given *in lieu* of a discipline-specific elective paper. Maximum number of students per project batch is 2.

4.2.6. Ability Enhancement Course

Ability Enhancement Course-1

The course (English I & II for Science Programmes / Communicative English I & II for Arts Programmes) shall be offered during the first and second semester for which examinations shall be conducted at the end of the semester. Four credits are awarded for each course and the examinations will be conducted at the end of each semester.

Ability Enhancement Compulsory Course-2

Students shall study the course Environmental Studies in the First / Second Semester for which examinations shall be conducted at the end of the semester.

4.2.7. Internship

The student shall undergo 15 days internship in the end of II and IV semester.

5.0 Value Added Courses

Courses of varying durations but not less than 30 hours which are optional and offered outside the curriculum that add value and help the students for getting placement. Students of all programmes are eligible to enroll for the value-added courses. The student can choose one Value-

added course per semester from the list of Value-added courses available in KAHE. The examinations shall be conducted at the end of the value added course at the Department level and the student has to secure a minimum of 50% of marks to get a pass. The certificate for the value added course for the passed students shall be issued duly signed by the HOD and Dean of the Faculty concerned.

6.0 Online Course

Student shall study at least one online course from SWAYAM / NPTEL / MOOC in any one of the first five semesters for which examination shall be conducted at the end of the course by the respective external agencies if any. The student can register to the courses which are approved by the Department. The student shall produce a Pass Certificate from the respective agencies before the end of the fifth semester. The credit(s) earned by the students will be considered as additional credit(s) over and above the credits minimum required to earn a particular degree.

7.0 Extension Activities

Every student is encouraged to participate in at least any one of the following Extension activities:

- NSS
- NCC
- Sports / Mass drill
- YRC
- Club activities
- Other Co-curricular and Extra curricular activities

The student's performance shall be examined by the staff in-charge of Extension Activities along with the faculty mentor and the Head of the respective department on the following parameters.

- 75 % weightage for active participation in Extension Activities in / out of the KAHE.
- 25 % weightage for Exemplary Awards / Honours / Prizes secured.

8.0 Marks for Co-curricular and Extra-curricular shall be sent to the CoE before the commencement of the Sixth End Semester Examinations.

The above activities shall be conducted outside the regular working hours of the KAHE.

5. MEDIUM OF INSTRUCTION

The medium of instruction and examinations for the courses under Language I – Tamil / Hindi / Malayalam / French / Sanskrit shall be in the language concerned. For all other courses, the medium of instruction and examination should be in English.

6. MAXIMUM MARKS

Each of the theory and practical courses shall carry a maximum of 100 marks. Out of which 40 marks is awarded for Continuous Internal Assessment (CIA) and 60 marks for End Semester Examinations (ESE).

Evaluation: Evaluation in the courses comprises two parts, one is the Continuous Internal Assessment (CIA) and the other one is the End Semester Examination (ESE).

7. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

a. Ideally, every student is expected to attend all classes and should secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

b. A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed minimum attendance requirements and shall be permitted to appear for the examination on the recommendation of the Head of Department concerned and Dean to condone the shortage of attendance. The Head of Department has to verify and certify the genuineness of the case before recommending to the Dean concerned. However, the candidate has to pay the prescribed condonation fee to the KAHE.

c. However, a candidate who has secured attendance less than 64% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for his/her supplementary examinations, if any and he/she has to re-do the same semester with the approval of the "Students' Affairs Committee" and Registrar.

8. a. FACULTY MENTOR

To help students in planning their courses of study and for general advice on the academic programme, the HoD shall allot twenty students to a faculty who will function as faculty mentor throughout their period of study. Faculty mentor shall advise the students and monitor their behavior and academic performance. Problems if any shall be counseled by them periodically. The Faculty mentor is also responsible to inform the parents of their wards' progress. Faculty mentor shall display the cumulative attendance particulars of his / her ward students' periodically (once in 2 weeks) on the Notice Board to enable the students, know their attendance status and satisfy the **clause 7** of this regulation.

b. **ONLINE COURSE COORDINATOR**

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinators shall advice the students regarding the online courses and monitor their course.

9. CLASS COMMITTEE

Every class shall have a Class Committee consisting of the faculty members of the various courses of the class concerned, student representatives (Minimum 2 boys and 2 girls of various capabilities and Maximum of 6 members) and the concerned HoD / senior faculty as Chairperson. The objective of the Class Committee Meeting is all about the teaching – learning process. Class Committee shall be convened at least once in a month. The functions of the Class Committee shall include

- Analysing and solving problems experienced by students in the class room and in the laboratories.
- Analyzing the performance of the students of the class after each test and finding the ways and means to improve the performance.
- The Class Committee of a particular class of any department is normally constituted by the HoD / Chairperson of the Class Committee. However, if the students of different departments are mixed in a class, the Class Committee shall be constituted by the respective Dean of the Faculty.
- The class committee shall be constituted during the first week of each semester.

- The HoD / Chairperson of the Class committee is authorized to convene the meeting of the class committee.
- The respective Dean of the Faculty has the right to participate in any Class committee meeting.
- The Chairperson is required to prepare the minutes of every meeting, and submit the same to Dean concerned within two days after having convened the meeting. Serious issues if any shall be brought to the notice of the Registrar by the HoD / Chairperson immediately.

10. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or department shall have a "Course Committee" comprising all the teachers handling the common course with one of them nominated as Course Coordinator. The nomination of the course coordinator shall be made by the respective Dean depending upon whether all the teachers handling the common course belong to a single department or to various other departments. The 'Course Committee' shall meet in order to arrive at a common scheme of evaluation for the tests to ensure a uniform evaluation of the tests. If feasible, the course committee shall prepare a common question paper for the Internal Assessment test(s). Course Committee Meeting is conducted once in a semester.

11. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

11.1 **Attendance and assessment:** Every Faculty is required to maintain an **Attendance and Assessment Record (Log book)** which consists of attendance of students marked for each lecture / practical / project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the HoD once in a fortnight for checking the syllabus coverage and the records of test marks and attendance. The HoD shall sign with date after due verification. The same shall be submitted to respective Dean once in a month. After the completion of the semester the HoD should keep this record in safe custody for five years. Because records of attendance and assessment shall be submitted for Inspection as and when required by the KAHE / any other approved body.

11.2 **Continuous Internal Assessment (CIA)**: The performance of students in each course will be continuously assessed by the respective faculty as per the guidelines given below:

Theory Courses

S. No.	Category	Maximum Marks
1.	Assignment*	5
2.	Attendance	5
3	Seminar	5
4.	Test – I (1 ½ units- Unit I and II)	8
5	Test – II (1 ½ units Unit II and III)	8
6	Test III (2 units Unit IV and V)	9
Continuous Internal Assessment : Total		40

* Two Assignments (Assignment I before Internal Test – I and assignment II before Internal Test – II).

Practical Courses

S. No.	Category	Maximum Marks
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	20
5.	*Viva – voce* [Comprehensive]*	5
Continuous Internal Assessment: Total		**40**

* Includes *Viva- voce* conducted during the model Exam practical.

Every practical Exercise / Experiment shall be evaluated based on the conduct of Exercise/ Experiment and records maintained.

11.3 Pattern of Test Question Paper

Portions for Internal Test – I : First 1 ½ Units(Unit I and II)

Portions for Internal Test – II : Second 1 ½ Units (Unit II and III)

Portions for Internal Test – III : Two units (Unit IV and V)

Instruction	Remarks
Maximum Marks	50 marks
Duration	2 Hours
Part – A	Objective type (20x1=20)
Part - B	Short Answer Type (3 x 2 = 6)
Part - C	3 Eight mark questions 'either – or' choice (3 x 8 = 24 Marks)

11.4 Attendance

Marks Distribution for Attendance

S. No.	Attendance (%)	Maximum Marks
1	91 and above	5.0
2	81 - 90	4.0
3	76 - 80	3.0
4	Less than 75	0

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12. ESE EXAMINATIONS

12.1 End Semester Examination (ESE): End Semester Examination will be held at the end of each semester for each course. The question paper is for a maximum 60 marks.

Pattern of ESE Question Paper:

Instruction	Remarks
Maximum Marks	60 marks for ESE.
Duration	3 hours (½ Hr for Part – A Online & 2 ½ Hours for Part – B and C
Part - A	20 Questions of 1 mark each (20 x 1 = 20 Marks) Question No. 1 to 20 Online Multiple Choice Questions
Part- B	5 Questions of 2 marks each(5 x 2 = 10 Marks) Covering all the five units of the syllabus Question No. 21 to 25
Part- C	5 six marks Questions of 6 marks each (5 x 6 = 30 Marks.) Question No. 26 to 30 will be 'either-or' type, covering all five units of the syllabus; i.e., Question No. 26: Unit - I, either 26 (a) or 26 (b), Question No. 27: Unit - II, either 27 (a) or 27 (b), Question No. 28: Unit - III, either 28 (a) or 28 (b), Question No. 29: Unit - IV, either 29 (a) or 29 (b), Question No. 30: Unit - V, either 30 (a) or 30 (b)

12.2 **Practical:** There shall be combined valuation. The pattern of distribution of marks shall be as given below.

Experiments	: 40 Marks
Record	: 10 Marks
Viva-voce	: 10 Marks
Total	**: 60 Marks**

Record Notebooks for Practical Examination

Candidate taking the practical examination should submit Bonafide Record Notebook prescribed for the practical examination; failing which the candidate will not be permitted to take the practical examination.

In case of failures in Practical Examination, the marks awarded for the Record at the time of first appearance of the Practical Examination shall remain the same at the subsequent appearance also by the candidate.

12.3. **Evaluation of Project Work**

12.3.1 The project work shall carry a maximum of 100 marks. (CIA - 40 and ESE – 60*)

*Combined valuation of Internal and External Examiners.

12.3.2 The project report prepared according to the approved guidelines and duly signed by the supervisor(s) shall be submitted to HoD.

12.3.3 The evaluation of the project will be based on the project report submitted and a *viva-voce* Examination by a team consisting of the supervisor, who will be the Internal Examiner and an External Examiner who shall be appointed by the COE. In case the guide is not available, the HoD shall act as an Internal Examiner for the same.

12.3.4 If a candidate fails to submit the project report on or before the specified date given by the Examination Section, the candidate is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester.

If a candidate fails in the respective viva-voce examinations he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. For this purpose the same Internal and External examiner shall evaluate the resubmitted report.

12.3.5 Copy of the approved project report after the successful completion of *viva-voce* examination shall be kept in the KAHE library.

13. PASSING REQUIREMENTS

13.1 Passing minimum: There is a passing minimum 20 marks out of 40 marks for CIA and the passing minimum is 30 marks out of 60 marks in ESE. The overall passing in each course is 50 out of 100 marks (Sum of the marks in CIA and ESE examination).

13.2 If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 13.1, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till he / she receives a pass both in CIA and ESE (vide Clause 2.1).

13.3 Candidate failed in CIA will be permitted to improve CIA marks in the subsequent semesters by writing tests and by re-submitting Assignments.

13.4 CIA marks (if it is pass) obtained by the candidate in the first appearance shall be retained by the Office of the Controller of Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE

13.5 Candidate who is absent in ESE in a Course / Practical / Project Work after having enrolled for the same shall be considered to have **failed** in that examination.

14. IMPROVEMENT OF MARKS IN THE COURSES ALREADY PASSED

Candidates desirous to improve the marks secured in a passed course in their first attempt shall reappear once (**only in ESE**) in the subsequent semester. **The improved marks shall be considered for classification but not for ranking.** If there is no improvement there shall be no change in the marks awarded earlier.

15. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

Letter grade	Marks Range	Grade Point	Description
O	91 - 100	10	OUTSTANDING
A+	81- 90	9	EXCELLENT
A	71-80	8	VERY GOOD
B+	66- 70	7	GOOD
B	61 – 65	6	ABOVE AVERAGE
C	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	<50	-	REAPPEARANCE
AAA	-	-	ABSENT

16. GRADE SHEET

After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:

i. The list of courses enrolled during the semester and the grade scored.

ii. The Grade Point Average (**GPA**) for the semester and

iii. The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

iv. Remark on Extension Activities (only in the 6th Semester Grade Sheet)

GPA of a Semester and CGPA of a programme will be calculated as follows.

GPA of a Semester = (Sum of the product of the GP by the corresponding credits of the courses offered in that Semester) / (Sum of the credits of the courses of that Semester)

i.e. **GPA** of a Semester = $\frac{\sum_i CiGPi}{\sum_i Ci}$

CGPA of the entire programme = (Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme) / (Sum of the credits of the courses of the entire programme)

i.e. **CGPA** of the entire programme = $\frac{\sum_n \sum_i CniGPni}{\sum_n \sum_i Cni}$

where,

Ci is the credit fixed for the course 'i' in any semester

GPi is the grade point obtained for the course 'i' in any semester

'n' refers to the Semester in which such courses are credited.

Note: RA grade will be excluded for calculating **GPA** and **CGPA**.

17. REVALUATION

A candidate can apply for revaluation and re-totaling of his / her semester examination answer script (**theory courses only**), within 2 weeks from the date of declaration of results, on payment of a prescribed fee. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the HoD concerned**.** Revaluation is not permitted for supplementary theory courses.

18. TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling is allowed on representation (clause 17). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wishes. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the KAHE), The HoD of Department concerned, the faculty of the course and Dean from other discipline nominated by the KAHE and the CoE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

19. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the conferment of the Degree if he / she has

- Successfully completed all the components prescribed under Part I to Part IV in the CBCS pattern to earn the minimum required credits as specified in the curriculum corresponding to his / her programme within the stipulated period vide class 2.1.
- Not any disciplinary action pending against him / her.
- The award of the degree must be approved by the Board of Management.

20. CLASSIFICATION OF THE DEGREE AWARDED

20.1 Candidate who qualifies for the award of the Degree (vide clause 19) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8** shall be declared to have passed the examination in the **First Class with Distinction.**

20.2 Candidate who qualifies for the award of the Degree (vide clause 19) having passed the examination in all the courses within the specified maximum number of semesters (vide clause 2.1), securing a **CGPA not less than 6.5** shall be declared to have passed the examination in the **First Class**.

20.3 All other candidates (not covered in clauses 20.1 and 20.2) who qualify for the award of the degree (vide Clause 19) shall be declared to have passed the examination in the **Second Class**.

21. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

21.1 Candidate due to valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

21.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

21.3 Withdrawal of application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the HoD / Dean concerned and approved by the Registrar.

21.3.1 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

21.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during **VI semester**.

21.5 Withdrawal from the End semester examination is **NOT** applicable to arrears courses of previous semesters.

21.6 The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

22. PROVISION FOR AUTHORISED BREAK OF STUDY

22.1 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme**.** However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for

valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department stating the reasons therefore and the probable date of rejoining the programme.

22.2 The candidate thus permitted to rejoin the Programme after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the Regulations in force at that period of time.

22.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide Clause 20). However, additional break of study granted will be counted for the purpose of classification.

22.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2.1 irrespective of the period of break of study (vide clause 22.1) in order that he/she may be eligible for the award of the degree.

22.5 If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' or 'Withdrawal' (Clause 21 and 22) is not applicable for this case.

23. RANKING

A candidate who qualifies for the UG Degree programme passing all the Examinations in the first attempt, within the minimum period prescribed for the programme of study from Semester I through Semester VI to the programme shall be eligible for ranking. Such ranking will be confined to 10% of the total number of candidates qualified in that particular programme of study subject to a maximum of 10 ranks.

24. SUPPLEMENTARY EXAMINATION

Supplementary Examination will be conducted only for the final semester students within ten days from the date of publication of results for students who have failed in one theory course only. Such students shall apply with prescribed fee to the Controller of Examinations within the stipulated time.

25. DISCIPLINE

25.1. If a student indulges in malpractice in any of the Internal / External Examinations he / she shall be liable for punitive action as prescribed by the KAHE from time to time.

25.2. Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the KAHE. The erring students will be referred to the disciplinary committee constituted by the KAHE, to enquire into acts of indiscipline and recommend the disciplinary action to be taken.

26. REVISION OF REGULATION AND CURRICULUM

Karpagam Academy of Higher Education may from time to time revise, amend or change the Regulations, Scheme of Examinations and syllabi if found necessary.

Annexure I

S.No	Programme	Subject	Eligibility
1	B. Sc.	Biochemistry	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Biology or Botany or Zoology or chemistry as subjects at the Higher Secondary level.
2	B. Sc.	Biotechnology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Biology or Botany or Zoology as subjects at the Higher Secondary level.
3	B. Sc.	Computer Science	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3-year diploma after 10^{th} or 10+2 pattern of education taking computer science/maths as one of the subject.
4	B.Sc.	Mathematics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Mathematics /statistics as subjects at the Higher Secondary level. (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking maths as one of the subject.
5	B.Sc.	Physics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Physics as one of the subjects at the Higher Secondary level (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking physics as one of the subject.
6	B. Sc.	Chemistry	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Chemistry as one of the subjects at the Higher Secondary level.
7	B. Sc.	Microbiology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or

			Board under the 10+2 pattern taking Biology or Botany or Zoology as subjects at the Higher Secondary level.
8	B. Sc.	Information Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking computer science/maths as one of the subject.
9	B. Sc.	Computer Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking computer science/maths as one of the subject.
10	B.Sc.	Computer Science(Cognitive Systems)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3-year diploma after 10^{th} or 10+2 pattern of education taking computer science/maths as one of the subject.
11	B.Sc.	Computer Science (Artificial Intelligence and Data Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking computer science/maths as one of the subject.
12	BCA	Computer Application	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
13	B.Sc.	Applied Science (Material Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Physics as one of the subjects at the Higher Secondary level (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking the respective subject as one of the subject.

14	B.Sc.	Applied Science (Foundary Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Physics as one of the subjects at the Higher Secondary level (OR) 3 year diploma after 10^{th} or 10+2 pattern of education taking the respective subject as one of the subject.
15	B. Com.	Commerce	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
16	B.Com (CA)	Commerce with Computer Applications	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern.
17	B. Com. (PA)	Commerce with Professional Accounting	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
18	B. Com. (BPS)	Commerce with Business Process Services	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
19	B.B.A.	Business Administration	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
20	B. Com	Financial Analytics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
21	B. Com	International Accounting and Finance	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .

PROGRAM OUTCOMES: The program must enable students to attain by the time of graduation

a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

c) An ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs.

d) An ability to function effectively on teams to accomplish a common goal

e) An understanding of professional, ethical, legal, security and social issues and responsibilities

f) An ability to communicate effectively with a range of audiences

g) An ability to use current techniques, skills and tools necessary for computing practice

h) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking and web systems and technologies

i) An ability to effectively integrate IT-based solutions into the user environment

j) An understanding of best practices and standards and their application

PROGRAM SPECIFIC OUTCOME (PSOs)

k) Understand analyze and develop computer programs in the areas related to Database systems and Big data Analytics, cloud computing, soft computing, IoT, Image processing, Green computing, web designing, mobile computing and networking for efficient design of computer based system of varying complexity.

l) Apply standard software Engineering practices and strategies in software project development using open-source programming environment to deliver a quality for business success.

m) Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

n) An ability to produce cost effective, quality and maintainable software products and solutions (services) meeting the global standards and requirements with the knowledge acquired and using the emerging techniques, tools and software engineering methodologies and principles and able to comprehend and write effective project reports in multidisciplinary environment in the context of changing technologies.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I : To be a working Information Technology (IT) professional with core competencies that can be used on multi-disciplinary projects

PEO II : To understand the importance of relationship building within the IT industry

PEO III : To understand the need for lifelong learning in the exploration and journey in IT

PEO IV : To understand, evaluate and practice ethical behavior within the IT industry

PEO V : To be cognizant of security issues and their impacts on industry

MAPPING of PEOs and POs

)s	a		C	d	e	f	F	h	i	J	k	l	m	
O I	X	X	X				X	X	X				X	
O II				X	X	X								X
O III	X	X						X		X	X			
O IV			X	X	X				X			X		
O V					X					X		X		

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UG PROGRAM (CBCS) – B.Sc. Computer Science
(2021–2022 Batch and onwards)

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks			Category	Page No
		PEOs	POs	L	T	P		CIA	ESE	Total		
								40	60	100		
SEMESTER – I												
21LSU101	Language – I	IV	d,e	4	-	-	4	40	60	100	AEC	1
21ENU101	English-I	I	a,b, c	4	-	-	4	40	60	100	AEC	4
21CSU101	Object Oriented Programming using C++	I	b,c, g	4	-	-	4	40	60	100	Core	5
21CSU102	Web Designing	III	h,j	4	-	-	4	40	60	100	Core	7
21CSU103	Numerical Methods	I	a,b, c,g	4	-		4	40	60	100	Allied	9
21CSU111	Object Oriented Programming using C++ - Practical	I	a,c, g	-	-	4	2	40	60	100	Core	11
21CSU112	Web Designing - Practical	I	a,c, g	-	-	3	2	40	60	100	Core	13
21CSU113	Numerical Methods - Practical	I	a,c, g	-	-	3	2	40	60	100	Allied	15
Semester Total				**20**	**-**	**10**	**26**	**320**	**480**	**800**		
SEMESTER – II												
21LSU201	Language – II	IV	d,e	4	-	-	4	40	60	100	AEC	16
21ENU201	English –II	II	d,f	4	-	-	4	40	60	100	AEC	19
21CSU201	Programming in JAVA	I	c,h, i	6	-	-	6	40	60	100	Core	20
21CSU202	Discrete Structures	IV	e,i	5	-	-	5	40	60	100	Allied	22
21CSU211	Programming in JAVA - Practical	IV	e,i	-	-	4	2	40	60	100	Core	24
21CSU212	Discrete Structures - Practical	I	a,c, h,i	-	-	4	2	40	60	100	Allied	26
21AEC201	Environmental Studies	IV	d,e	3	-	-	3	40	60	100	AEC	28
Semester Total				**22**	**-**	**8**	**26**	**280**	**420**	**700**		
SEMESTER – III												
21CSU301	Data Structures	I	a,b,g, h	4	-	-	4	40	60	100	Core	30
21CSU302	Relational Database Management Systems	III	a,b,h, k	4	-	-	4	40	60	100	Core	32
21CSU303	Operations Research	III	a,b,h, k	4	-	-	4	40	60	100	Allied	34

21CSU304A	Programming in Python	I	a,b,c, m	3	-	-	3	40	60	100	SEC	36
21CSU304B	Scripting Languages	I	a,b,g, h									38
21CSU311	Data Structures - Practical	III	a,b,h, k	-	-	4	2	40	60	100	Core	40
21CSU312	Relational Database Management Systems - Practical	III	a,b,j, k	-	-	4	2	40	60	100	Core	42
21CSU313	Operations Research - Practical	III	a,b,j, k	-	-	4	2	40	60	100	Allied	46
21CSU314A	Programming in Python - Practical	I	a,b,c, m	-	-	3	1	40	60	100	SEC	47
21CSU314B	Scripting Languages - Practical	I	a,b,g, h									49
Semester Total				**15**	**-**	**15**	**22**	**320**	**480**	**800**		
SEMESTER – IV												
21CSU401	Operating Systems	III	a,b	4	-	-	4	40	60	100	Core	51
21CSU402	Software Engineering and Testing	III	a,b,j, k	4	-	-	4	40	60	100	Core	53
21CSU403	Business Accounting	I	a,b,c, m	4	-	-	4	40	60	100	Allied	55
21CSU404A	.Net Programming	III	a,b,h, j,k	3	-	-	3	40	60	100	SEC	57
21CSU404B	Android Programming	III	a,b,h, j,k									59
21CSU411	Operating Systems - Practical	I	a,b,c,	-	-	4	2	40	60	100	Core	61
21CSU412	Software Engineering and Testing - Practical	IV	c,d,e, l	-	-	4	2	40	60	100	Core	63
21CSU413	Business Accounting - Practical	IV	c,d,e, l	-	-	4	2	40	60	100	Allied	65
21CSU414A	.Net Programming - Practical	I	a,b,g,	-	-	3	1	40	60	100	SEC	66
21CSU414B	Android Programming - Practical	I	a,b,g,									68
Semester Total				**15**	**-**	**15**	**22**	**320**	**480**	**800**		
SEMESTER –V												
21CSU501	Data Communication and Networks	I	b,e,m	4	-	-	4	40	60	100	Core	70
21CSU502A	PHP Programming	III	a,b,h, j	4	-		4	40	60	100	DSE	72
21CSU502B	R Programming	IV	c,d,e, l									74
21CSU503A	Compiler Design	III	a,b,h	4	-	-	4	40	60	100	DSE	76
21CSU503B	Cloud Computing	III	a,b,h									78
21CSU504A	Machine Learning	IV	c,e,i,l	3	-	-	3	40	60	100	DSE	80

21CSU504B	Computer Graphics	III	b,h,j									82
21CSU511	Data Communication and Networks - Practical	I	b,e,m	-	-	4	2	40	60	100	Core	84
21CSU512A	PHP Programming - Practical	III	a,b,h,j	-	-	4	2	40	60	100	DSE	86
21CSU512B	R Programming - Practical	III	a,b,h,j									87
21CSU513A	Compiler Design - Practical	III	a,b,h,j	-	-	4	2	40	60	100	DSE	89
21CSU513B	Cloud Computing - Practical	III	a,b,h,j									91
21CSU514A	Machine Learning - Practical	I	a,b,g,h	-	-	3	1	40	60	100	DSE	93
21CSU514B	Computer Graphics - Practical	I	a,b,g									95
	Semester Total			**15**		**15**	**22**	**320**	**480**	**800**		
SEMESTER –VI												
21CSU601	Data Mining	V	e,j,l	4	-	-	4	40	60	100	Core	97
21CSU602A	Information Security and Cyber Laws	I	a,d,g,m	4	-	-	4	40	60	100	DSE	99
21CSU602B	Digital Image Processing	I	a,d,g,									101
21CSU603A	Internet Technologies	I	a,c,g,	3	-	-	3	40	60	100	DSE	103
21CSU603B	E-Commerce Technologies	III	a,b,h,j,k									105
21CSU611	Data Mining - Practical	IV	c,d,e	-	-	4	2	40	60	100	Core	107
21CSU612A	Information Security and Cyber Laws - Practical	I	a,d,g,m	-	-	4	2	40	60	100	DSE	109
21CSU612B	Digital Image Processing - Practical	I	a,d,g									111
21CSU613A	Internet Technologies - Practical	I	a,c,g,m	-	-	3	1	40	60	100	DSE	113
21CSU613B	E-Commerce Technologies - Practical	III	a,b,h,j,k									114
21CSU691	Project	II	d,e,f,	8	-	-	6	40	60	100		116
ECA / NCC / NSS / Sports / General interest etc		Good										
	Semester Total			**19**	**-**	**11**	**22**	**280**	**420**	**700**		
	Grand Total			**106**	**-**	**74**	**140**	**1840**	**2760**	**4600**		

Ability Enhancement Courses (AEC)		
Semester	**Course Code**	**Name of the Course**
I	21LSU101	Language – I
	21ENU101	English-I
II	21LSU201	Language – II
	21ENU201	English –II
	21AEC201	Environmental Studies

Allied Courses		
Semester	**Course Code**	**Name of the Course**
I	21CSU103	Numerical Methods
	21CSU113	Numerical Methods - Practical
II	21CSU202	Discrete Structures
	21CSU212	Discrete Structures - Practical
III	21CSU303	Operations Research
	21CSU313	Operations Research - Practical
IV	21CSU403	Business Accounting
	21CSU413	Business Accounting - Practical

SKILL ENHANCEMENT COURSE (SEC)		
Semester	**Course Code**	**Name of the Course**
Semester– III	21CSU304A	Programming in Python
	21CSU304B	Scripting Languages
	21CSU314A	Programming in Python - Practical
	21CSU314B	Scripting Languages - Practical
Semester - IV	21CSU404A	.Net Programming
	21CSU404B	Android Programming
	21CSU414A	.Net Programming – Practical
	21CSU414B	Android Programming – Practical

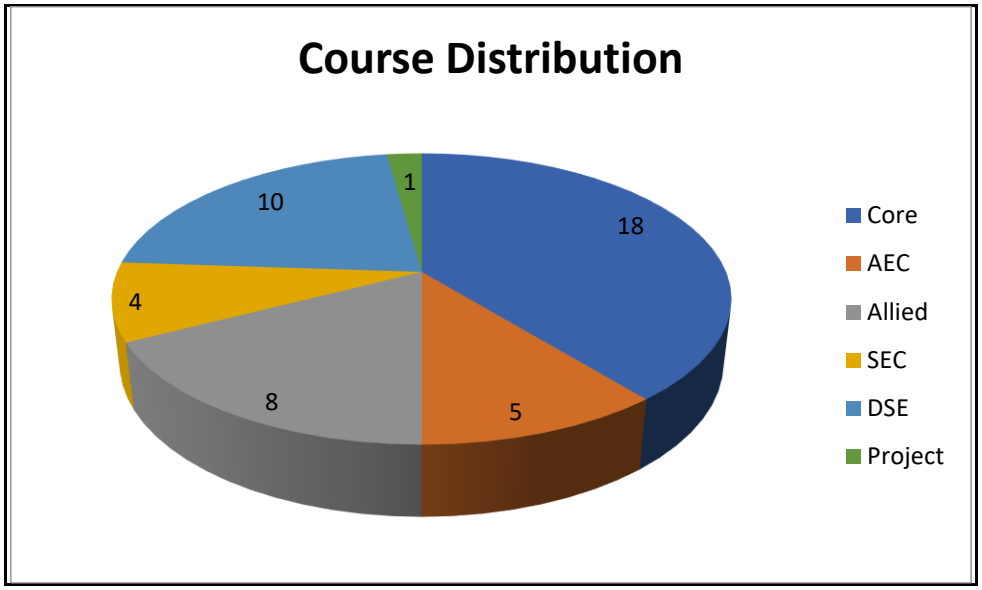
Discipline Specific Elective Courses (DSE)		
Semester	**Course Code**	**Name of the Course**
Semester– V	21CSU502A	PHP Programming
	21CSU502B	R Programming
	21CSU503A	Compiler Design
	21CSU503B	Cloud Computing
	21CSU504A	Machine Learning
	21CSU504B	Computer Graphics
	21CSU512A	PHP Programming – Practical
	21CSU512B	R Programming – Practical
	21CSU513A	Compiler Design – Practical
	21CSU513B	Cloud Computing – Practical
	21CSU514A	Machine Learning – Practical

	21CSU514B	Computer Graphics – Practical
Semester - VI	21CSU602A	Information Security and Cyber Laws
	21CSU602B	Digital Image Processing
	21CSU603A	Internet Technologies
	21CSU603B	E-Commerce Technologies
	21CSU612A	Information Security and Cyber Laws – Practical
	21CSU612B	Digital Image Processing - Practical
	21CSU613A	Internet Technologies – Practical
	21CSU613B	E-Commerce Technologies - Practical

Core Courses		
Semester	**Course Code**	**Name of the Course**
I	21CSU101	Object Oriented Programming using C++
	21CSU102	Web Designing
	21CSU111	Object Oriented Programming using C++ - Practical
	21CSU112	Web Designing - Practical
II	21CSU201	Programming in JAVA
	21CSU211	Programming in JAVA - Practical
III	21CSU301	Data Structures
	21CSU302	Relational Database Management Systems
	21CSU311	Data Structures - Practical
	21CSU312	Relational Database Management Systems - Practical
IV	21CSU401	Operating Systems
	21CSU402	Software Engineering and Testing
	21CSU411	Operating Systems - Practical
	21CSU412	Software Engineering and Testing - Practical
V	21CSU501	Data Communication and Networks
	21CSU511	Data Communication and Networks - Practical
VI	21CSU601	Data Mining
	21CSU611	Data Mining - Practical

Course Distribution Table

Category	**No. of Courses**		**Total**
	Theory	**Practical**	
Core	9	9	18
AEC	5	0	5
Allied	4	4	8
SEC	2	2	4
DSE	5	5	10
Project	1	0	1
Total	26	20	46


Course Distribution
18
5
8
4
10
1
Core
AEC
Allied
SEC
DSE
Project

Semester – I

21LSU101 **Language – I** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனை மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்தியகுடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத்தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
3. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்';' இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத் திறன்மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
6. மொழிபெயப்புத்துறை சார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : தமிழ் இலக்கிய வரலாறு– I

(8மணிநேரம்)

முச்சங்க வரலாறு-சங்க இலக்கியத்தொகுப்பு-பாட்டும் தொகையும்- சங்கஇலக்கியச் சிறப்பியல்புகள்-சங்கம் மருவிய காலம்-பதினெண்கீழ்க்கணக்கு நூல்கள்–திருக்குறள்-நாலடியார்-நான்மணிக்கடிகை- பழமொழிநானூறு – பிற்கால அறஇலக்கியங்கள்-கொன்றைவேந்தன் – நீதிநூல்- காப்பியங்கள்-தமிழில் காப்பிய இலக்கணம்- தமிழில் பெருங்காப்பியங்களும் சிறு காப்பியங்களும்-இரட்டைக்காப்பியங்களாகச்சிலம்பும் மேகலையும்.

அலகு - II:சங்கஇலக்கியம் (12 மணிநேரம்)

அ).எட்டுத்தொகை

நற்றிணை:கொண்டல் மாமழை – குறிஞ்சி–தலைவன்கூற்று - 140

குறுந்தொகை:வாரார் ஆயினும், வரினும் –முல்லை– தலைவி கூற்று-110

ஐங்குறுநூறு :மருதம் –தோழி கூற்று-வேட்கைப்பத்து:வாழிஆதன் வாழி அவினி - 6

பதிற்றுப்பத்து: சிதைந்தது மன்ற- 27

பரிபாடல்:புறத்திரட்டு- மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-7, மாயோன் கொப்பூழ்-8, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை:பாலைக்கலி-செவிலி – எறித்தரு கதிர்தாங்கி-9

அகநானூறு:அன்னை அறியினும் அறிக–தோழி - நெய்தல் - 110

புறநானூறு :யாதும் ஊரே யாவருங் கேளிர்–பொதுவியல்- 192

ஆ).பத்துப்பாட்டு: நெடுநல்வாடை- கார்காலச் சிறப்பு : வையகம் பனிப்ப -1-70

அலகு – III: அறஇலக்கியம்

(10மணிநேரம்)

1. **திருவள்ளுவர்- திருக்குறள்**– அதிகாரம் 67 – வினைத்திட்பம், அதிகாரம் 100 - பண்புடைமை
2. **முன்றுறையரையனார் – பழமொழி நானூறு**5 பாடல்கள்

உணற்கு இனிய 5, பரந்த திறலாரை 32, நெடியது காண்கிலாய் 46, இனி யாரும் 153, உரைசான்ற 195.

3. **ஔவையார் – கொன்றை வேந்தன்** (1- 50 பாடல்கள்)

அன்னையும் பிதாவும் – புலையும் கொலையும் களவும் தவிர்

4. **வேதநாயகம்பிள்ளை - நீதிநூல்** – (அதிகாரம்-7- தாய்தந்தையரைப் போற்றுதல்-

தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள்)

சின்னவோர் பொருள், கடவுளை வருந்தி, எப்புவிகளும், வைத்தவர், ஈன்றவர்

அலகு - IV :காப்பிய இலக்கியம்
(10மணிநேரம்)

(அ). சிலப்பதிகாரம்(5 மணிநேரம்)

மங்கல வாழ்த்துப் பாடல்: (21-29)- நாக நீள் நகரொடு-கண்ணகி என்பாண் மன்னோ .

வழக்குரை காதை, (48-56) - நீர்வார் கண்ணை-புகா ரென்பதியே .

வஞ்சின மாலை: (5-34) - வன்னிமரமும் – பிறந்த பதிப் பிறந்தேன்.

நடுகற் காதை: (207-234) - அருத்திற லரசர் – மன்னவ ரேறென்

வாழ்த்துக்காதை: (9) - என்னேயிஃ தென்னே – மீவிசும்பிற் றோன்றுமால்.

(ஆ). மணிமேகலை (5 மணிநேரம்)

பசியின் கொடுமை: பாத்திரம் பெற்ற காதை:

'போதி நீழல்' - 'பெருகியதன்றோ' , 'ஆற்றுநர்க்களிப்போர்' - 'நல்லறம் கண்டனை' (73-98).

சிறைக்கோட்டம் அறக்கோட்டமாக்கிய காதை:மாவண் கிள்ளிக்கு காவலன் உரைத்தவை:

'பைஞ்சேறு மெழுகாப் பசும்பொன் மண்டபத்து -
அறவோர்க் காக்கினன் அரசாள் வேந்தன்' (116-163).

அலகு- V :அடிப்படை இலக்கணமும் பயன்பாட்டுத்தமிழும் -I
(8மணிநேரம்)

அ).எழுத்து, சொல், பொருள் இலக்கணங்கள்(4 மணிநேரம்)

1. முதல் மற்றும் சார்பெழுத்துகள்- பெயர்,வினை, இடை, உரிச்சொல் முதலான அடிப்படை இலக்கண விளக்கப் பயிற்சிகள்

2). அகத்திணை மற்றும் புறத்திணை இலக்கணங்கள்

ஆ). கடிதப்பயிற்சி (4 மணிநேரம்)

1. தன்விவரக் குறிப்புடன் வேலை வேண்டி விண்ணப்பம் எழுதுதல்
2. பல்கலைக்கழகப் பன்னாட்டுக்கருத்தரங்கச் செய்தியை நாளிதழில் வெளியிடவேண்டி நாளிதழின் பதிப்பாசிரியருக்குக் கடிதம்
3. கருத்தரங்கப் பங்கேற்புக்கு அனுமதிக் கடிதம்
4. பல்கலைக்கழக விழாவுக்குத் தலைமையேற்க வேண்டி, மாவட்ட ஆட்சியருக்கு விண்ணப்பம்
5. கல்விகடன் வேண்டி வங்கிமேலாளருக்கு விண்ணப்பம்
6. வசிப்பிடத்திற்கு அடிப்படை வசதி வேண்டி வட்டாட்சியருக்கு விண்ணப்பம்
7. தேசியவிருது பெற்ற நண்பனுக்குப் பாராட்டுக் கடிதம்
8. புத்தகங்கள் அனுப்பி உதவவேண்டி, பதிப்பகத்தாருக்கு விண்ணப்பம்

Semester – I

21ENU101 **English - I** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective:

- To give basic knowledge on grammar.
- To train communication in real life situation.
- To be familiar with the four basic skills of English.
- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.
- To provide aesthetic pleasure through literature.
- To develop the moral values of students.

Course Outcome:

1. Retrieve fundaments of English language to construct error free sentences.
2. Develop the knowledge of interpersonal skills.
3. Establish and maintain social relationships.
4. Develop communication skills in business environment.
5. Refine communication competency through LSRW skills.
6. Improving intrapersonal skills through literary works.

UNIT - I:**Grammar**

Types of Sentences, Subject and Predicate,Parts of Speech,Tenses, Preposition and Articles

UNIT – II:Communication Exercise

Importance of Business Language- Words often Confused- Words often Misspelt- Common Errors in English-Charts and Pictorial Writing.

UNIT – III: **Interpersonal Skills**

Greetings & Introduction- Giving & Denying Permission- Telephone Etiquette- Oral Presentation – Plan, PowerPoint Presentation- Preparation of Speech- Audience psychology- Secrets of Good Delivery

UNIT - IV: LSRW Skills

Listening- Listening and its types, Basic Listening Lessons

Speaking- Basics of speaking, Regular English, Business English, Interview English

Reading- Reading and its purposes, Types of Reading, Reading Techniques

Writing- Types of Writing, Components of Writing, Language and Style with accordance to the contexts

UNIT - V: Literature

Prose: Let's Do What India Needs fromUs -Dr.A.P.J. Abdul Kalam

Poem: A Prayer for My Daughter - W.B. Yeats

Short Story: Sparrows- K. Ahmad Abbas

Suggested Reading:

1. Hewings Martin,2013Advanced Grammar in Use, Cambridge University Press
2. Haines *Simon,2015 Advanced Skills, A resource Book of Advanced- Level Skill Activities*

Semester – I

21CSU101 Object Oriented Programming Using C++ 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

- To understand how C++ improves C with object-oriented feature.
- To learn the syntax and semantics of classes in C++ programming language.
- To learn how to perform operator overloading and inheritance.
- To learn how to design C++ using pointers.
- To learn file handling in C++.
- To use the basic object-oriented design principles in computer problem solving.

Course Outcomes (COs)

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

1. Understand the difference between top-down and bottom-up approach.
2. Apply the concepts of object-oriented programming in constructor and destructor.
3. Understand how to apply the major object-oriented concepts to implement inheritance and polymorphism.
4. Apply pointer concepts in C++
5. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems
6. Use the concepts of preprocessor directives and macros.

Unit I - Introduction to C and C++

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Benefits of OOPs – Applications of OOPs, Using main () function.

Data Types, Variables, Constants, Operators and Basic I/O: Declaring, Defining and Initializing Variables, Compiling and Executing Simple Programs in C & C++,Scope of Variables, Input and Output Statements in C & C++, Using Named Constants, Keywords, Data Types, Casting of Data Types.

Expressions, Conditional Statements and Iterative Statements: Simple Expressions, Operators, Understanding Operators Precedence, Conditional Statements, Iterative Statements ,Use of break and continue in Loops, Using Nested Statements

Unit II - Classes and Objects

Classes and Objects: Specifying a class – Creating Objects – Accessing Class Members – Defining Member Functions – Static Data Members – Static Member Functions - Array of Objects – Utility of functions, Call by Value, Call by Reference - Friend Functions. Constructors and Destructors: - Constructors – Parameterized Constructors - Multiple Constructors in a Class – Constructors with Default Arguments - Copy Constructor - Dynamic Constructor – Destructors.

Unit III - Operator Overloading and Inheritance

Operator overloading: Defining operator overloading – overloading unary operators – overloading binary operators – overloading binary operators using friends – type conversions. Inheritance: - Inheritance – defining derived classes – single, multilevel, multiple, hierarchical inheritance- hybrid inheritance – virtual base classes – abstract classes.

Unit IV - Pointers and I/O Operations

Pointers: Pointers to objects – this pointer – pointers to derived classes – virtual functions- Pure Virtual Functions. Managing console I/O operations:- C++ streams – C++ stream classes – unformatted I/O operations – formatted console I/O operations – Managing output with manipulators.

Unit V - File Management

Files - Classes for file stream operations – Opening and Closing a file – sequential input and output operations – updating a file random access – Command Line Arguments. Templates and Exceptions: - Templates – class templates – function templates – member function templates – exception handling.

Suggested Readings

1. Antonio Mallia, Francesco Zoffoli,2019, C++ Fundamentals, Packt Publishing, Ltd.
2. Joel Murach, Mary Delamater, 2018, C++ Programming ,Mike Murach & Associates Inc.
3. Bjarne Stroustroup, 2014, Programming - Principles and Practice using C++, 2nd Edition, Addison-Wesley.
4. Stefan Bjornander, 2016, C++ Windows Programming, Published byPackt Publishing Ltd.
5. Harry, H. Chaudhary, 2014, Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.
6. Debasish Jana, 2014, C++ And Object-Oriented Programming Paradigm,Published by PHI Learning Pvt. Ltd
7. Richard L. Stegman, 2016, Focus on Object-oriented Programming with C++, 6th Edition, CreateSpace Independent Publishing Platform.

Websites

1. www.programmingsimplified.com
2. www.programiz.com / cpp-programming
3. www.cplusplus.com
4. www.learncpp.com
5. www.udemy.com
6. https://nptel.ac.in/courses/106101208/

LMS

http://172.16.13.33/course/view.php?id=599

Semester – I

21CSU102 Web Designing 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand the technologies used in Web Programming.
- To know the importance of object-oriented aspects of Scripting.
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To design an interactive website using HTML, CSS and JavaScript.

Course Outcomes (COs)

Upon Completion of the course, the students will be able to

1. Apply basic HTML tags to format text in a web page
2. Use forms and frames in HTML to design interactive web pages.
3. Create a basic website using HTML and Cascading Style Sheets.
4. Learn to use JavaScript inside HTML to create web pages.
5. Validate user input using JavaScript objects and Events.
6. Design and implement dynamic web pages using HTML, CSS and JavaScript.

Unit I - HTML

What is HTML -HTML Documents -Basic structure of an HTML document -Creating an HTML document - Mark up Tags -Heading-Paragraphs - Line Breaks - HTML Tags. Introduction to elements of HTML- Working with Text - Working with Lists, Tables -Working with Hyperlinks, Images and Multimedia.

Unit II – Frames

Introduction to Frame, <frameset> and <frame> Tag with its Attributes, Creating Frames, Linking Frames, <noframes> tag, Complex Framesets, Floating or Inline Frame. Forms : <Form> Tag and its Attributes, <Input> Tag and its Attributes, Form Controls: Text Controls, Password Fields, Radio Buttons, Checkboxes, Reset and Submit Buttons, Form Control Selection, Option Processing and Text Area, Hidden Fields. Embedding Multimedia: Introduction, Embedding Multimedia, Inserting Sound/Audio Formats, Inserting Video File Formats.

Unit III - CSS

Concept of CSS- Creating Style Sheet - CSS Properties -CSS Styling: Background-Text Format-Controlling Fonts - Working with block elements and objects - Working with Lists and Tables - CSS Id and Class - Box Model: Introduction- Border properties- Padding Properties- Margin properties - CSS Advanced:Grouping-Dimension-Display-Positioning-Floating-Align-Pseudo class-Navigation Bar-Image Sprites-Attribute sector.CSS Color -Creating page Layout and Site Designs.

Unit IV – JavaScript Programming

Introduction to JavaScript: Utility of JavaScript-Evolution of the JavaScript Language-JavaScript Versions and Browser Support- Differences Between Client-Side vs. Server-Side

JavaScript-Statements and Operators-Variable Declarations- Operators and Statements- Operator Precedence- Implementing Control Constructs: Conditional and Looping Constructs- Implementing Functions: Defining Functions-Calling Functions- Passing Arguments- Local vs. Global Variables- Using the Return Statement-Nested Functions.

Unit V - JavaScript Objects

The JavaScript Object Model and Hierarchy- JavaScript Object Properties-Object Methods- New Keyword- This Keyword- Creating New Object Instances Using Constructor - JavaScript Object Constructor - Functions- String- Date and Array Objects- Construction of Custom Objects with Individual Properties and Methods . Event Handling: Event-Driven Programming Model - Handling Link Events, Window Events, Image Events, Form Events- Setting Event Handlers- In-Line or Referencing.

Suggested Readings

1. “Web Coding & Development All-in-One For Dummies”,Paul McFedries ,2018
2. “Fundamentals of Web Development” ,Randy Connolly, Ricardo Hoar ,2017
3. Principles of web design.,Joel sklar,sixth edition,2015
4. “HTML and CSS: Design and Build Websites” ,Jon Duckett,2014
5. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013

Websites

1. http://www. freeCodeCamp Guides.com/
2. http://www. Codrops CSS Reference/
3. https://developer.mozilla.org/enUS/docs/Web/JavaScript/Guide.
4. http://www.w3schools.com.
5. https://nptel.ac.in/courses/106105084/
6. https://freevideolectures.com/blog/webdesign-online-courses-and-video-lectures/

Semester – I

21CSU103 **Numerical Methods** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to

- To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
- To solve complex mathematical problems using only simple arithmetic operations.
- To formulate the mathematical models of physical situations that can be solved with arithmetic operations.
- To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.
- To facilitate numerical computing.

Course Outcomes(COs)

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

1. Apply Numerical analysis which has enormous application in the field of Science and some fields of Engineering.
2. Familiar with finite precision computation.
3. Familiar with numerical solutions of nonlinear equations in a single variable.
4. Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
5. Familiar with calculation and interpretation of errors in numerical method.
6. Familiar with programming with numerical packages like MATLAB

UNIT I

The Solutions of Numerical Algebraic and Transcendental equations: Bisection method -iteration method- False Position method - Newton's method .

UNIT II

Solution of Simultaneous Linear algebraic Equation – Gauss elimination method- Gauss Jordon method- Gauss Jacobi method- Gauss Seidel methods.

UNIT III

Interpolation :Gregory-Newton forward and backward interpolation Formula– equidistant terms with one or more missing values - Lagrange and Inverse Lagrange Interpolation formula.

UNIT IV

Numerical Differentiations : Newton's forward Difference and Newton's Backward Difference formula. Numerical Integration: Trapezoidal Rule & Simpson's Rule.

UNIT V

Numerical Solution of Ordinary Differential Equations:Taylor's series - Euler's method – Modified Euler's method - Runge-Kutta methods (fourth order Runge Kutta method only) .

SUGGESTED READINGS

1. P. Kandasamy, Dr. K. Thilagavathy, Dr. K. Gunavathi (2013), Numerical Methods, Published By S.Chand & Company Pvt. Ltd., New Delhi.
2. M.K. Jain, S.R.K. Iyengar and Jain R.K (2012), Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi.
3. T. Veerarajan and T. Ramachandran (2008), Numerical Methods with Programs in C, Tata McGraw-Hill Publishing company limited, New Delhi.
4. B. Bradie (2007), A Friendly Introduction to Numerical Analysis, Pearson Education, India.

WEBSITES

1. https://youtu.be/tcqsLqlyjmk
2. https://youtu.be/0XcOwBY_Ryw

Semester – I

21CSU111 Object Oriented Programming Using C++ - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To understand how C++ improves C with object-oriented feature.
- To learn the syntax and semantics of classes in C++ programming language.
- To learn how to perform operator overloading and inheritance.
- To learn how to design C++ programs using pointers.
- To learn file handling in C++.
- To write programs in C++ using the concepts learned above.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Understand the difference between top-down and bottom-up approach.
2. Apply the concepts of object-oriented programming in constructor and destructor.
3. Understand how to apply the major object-oriented concepts to implement inheritance and polymorphism.
4. Apply pointer concepts in C++
5. Use the concepts of preprocessor directives and macros.
6. Write programs in C++ using the concepts learned above

List of Programs

1. Write a C++ program to print sum of digits.
2. Write a C++ program to check palindrome number.
3. Write a program to swap numbers using friend function.
4. Write a program to perform multiplication of two matrices using operator overloading.
5. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers.
6. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
7. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
8. Write a C++ Program to store GPA of n number of students and display it where n is the number of students entered by user (Memory Management).
9. Write a program to demonstrate the try, catch block in C++
10. Write a C++ program that uses a single file for both reading and writing the data.

Suggested Readings

1. Antonio Mallia, Francesco Zoffoli,2019, C++ Fundamentals, Packt Publishing, Ltd.
2. Joel Murach, Mary Delamater, 2018, C++ Programming ,Mike Murach & Associates Inc.
3. Bjarne Stroustroup, 2014, Programming - Principles and Practice using C++, 2nd Edition, Addison-Wesley.

4. Stefan Bjornander, 2016, C++ Windows Programming, Published byPackt Publishing Ltd.
5. Harry, H. Chaudhary, 2014, Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.
6. Debasish Jana, 2014, C++ And Object-Oriented Programming Paradigm,Published by PHI Learning Pvt. Ltd
7. Richard L. Stegman, 2016, Focus on Object-oriented Programming with C++, 6th Edition, CreateSpace Independent Publishing Platform.

Websites

1. www.programmingsimplified.com
2. www.programiz.com / cpp-programming
3. www.cplusplus.com
4. www.learncpp.com
5. www.udemy.com

Semester – I

21CSU112 Web Designing - Practical 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- To understand the technologies used in Web Programming.
- To know the importance of object-oriented aspects of Scripting.
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To design an interactive website using HTML, CSS and JavaScript.

Course Outcomes (COs)

Upon Completion of the course, the students will be able to

1. Select and apply markup languages for processing, identifying, and presenting of information in web pages.
2. Create and manipulate web media objects using editing software.
3. Create a basic website using HTML and Cascading Style Sheets.
4. Design and implement dynamic web pages using HTML, CSS and JavaScript.
5. Gain the skills and project-based experience needed for entry into web design and development careers.
6. Develop awareness and appreciation of the many ways that people access the web, and will be able to create standards-based websites that can be accessed by the full spectrum of web access technologies

List of Programs

1. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.
2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking
3. Create HTML document with Table

<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3"></td><td rowspan="2" colspan="2"></td></tr>
<tr><td colspan="3"></td></tr>
</table>

4. Create Form with Input Type, Select and Text Area in HTML.
5. Create an HTML containing Roll No., student‘s name and Grades in a tabular form.
6. Create an HTML document (having two frames) which will appear as follows

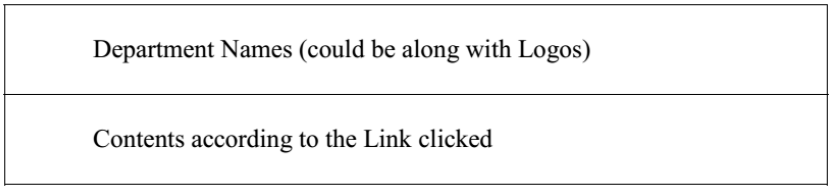
<table>
<tr><td>About

Department 1

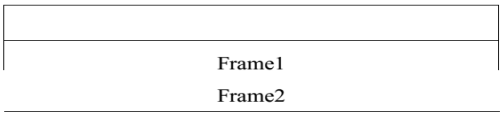
Department 2

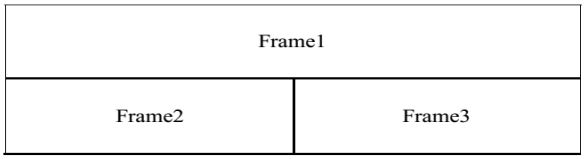
Department 3</td><td>This frame would show the contents according to the link clicked by the user on the left frame.</td></tr>
</table>

7. Create an HTML document containing horizontal frames as follows



8. Create a website of 6 – 7 pages with different effects as mentioned in above problems.
9. Create HTML documents (having multiple frames) in the following three formats





10. Create a form using HTML which has the following types of controls:
    V. Text Box
    VI. Option/radio buttons
    VII. Check boxes
    VIII. Reset and Submit buttons

List of Programs using JavaScript: Create event driven program for following:

11. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
12. Print the largest of three numbers. 81
13. Find the factorial of a number n.
14. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
15. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
16. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

Suggested Readings

1. "Web Coding & Development All-in-One For Dummies",Paul McFedries ,2018 "Fundamentals of Web Development" ,Randy Connolly, Ricardo Hoar ,2017
2. Principles of web design.,Joel sklar,sixth edition,2015
3. "HTML and CSS: Design and Build Websites", Jon Duckett,2014
4. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013

Websites

1. http://www. freeCodeCamp Guides.com/
2. http://www. Codrops CSS Reference/
3. https://developer.mozilla.org/enUS/docs/Web/JavaScript/Guide.
4. http://www.w3schools.com.

Semester – I

21CSU113 Numerical Methods - Practical 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

This course enables the students

- To solve simultaneous linear algebraic using various methods.
- To evaluate definite integrals using numerical integration
- To know problem- solving through (computer language) programming.
- To solve complex mathematical problems using only simple arithmetic operations.
- To formulate the mathematical models of physical situations that can be solved with arithmetic operations.
- To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.

Course Outcomes (COs)

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

1. Familiarize with the programming environment for numerical methods.
2. Develop proficiency skills to solve the algebraic equations.
3. Evaluate the definite integrals using computer programming techniques.
4. Familiarize with calculation and interpretation of errors in numerical method.
5. Get acquainted with programming with numerical packages like MATLAB
6. Get familiar with finite precision computation.

List of Practical (Using any software)

(Any 10 Programs)

1. Solution of simultaneous linear algebraic equations- Gauss Elimination Method
2. Solution of simultaneous linear algebraic equations- Gauss Jordan Method
3. Solution of simultaneous linear algebraic equations- Gauss Jacobi Method
4. Solution of simultaneous linear algebraic equations- Gauss Seidal Method
5. Computing Lagrange's interpolating polynomial
6. Computing Newton's interpolating polynomial
7. Numerical Integration – Simpson's one third rule
8. Numerical Integration – Simpson's three eight rule
9. Numerical Integration – Trapezoidal rule
10. Solution for ordinary differential equation-Euler method.
11. Solution for ordinary differential equation- Runge Kutta Second order.

Semester – II

21LSU201 **Language II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam: 3 Hours

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனை மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்தியகுடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத்தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
3. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்';' இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத் திறன்மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
6. மொழிபெயப்புத்துறை சார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : தமிழ் இலக்கிய வரலாறு- II
(5மணிநேரம்)

தமிழ் இலக்கிய வரிசையில் திருமுறைகளும் நாலாயிரத் திவ்யப்பிரபந்தமும்-பன்னிரு திருமுறைகள் அறிமுகம்- திருமுறை ஆசிரியர்களின் இலக்கியப் பங்களிப்பு-திருமுறைகளில் பக்திநெறியும் சமுதாய நோக்கும்-சமயக்குரவரின் அருள்நெறி- பன்னிரு ஆழ்வார்கள் வரலாறு-ஆழ்வார்களின் இலக்கியப் பங்களிப்பு-திவ்யப் பிரபந்தத்தில் பக்திநெறியும் இலக்கிய நயமும்-தமிழில் சிற்றிலக்கியக் காலமும் கருத்தும்- தொண்ணூற்றாறு வகைச் சிற்றிலக்கிய வரிசை- தமிழ் மொழியின்கவிதை - சிறுகதை – உரைநடை –இலக்கியங்களின்தோற்றம் – வளர்ச்சி – உத்திகள்–நாட்டுப்புறஇலக்கியங்கள்-கொங்குநாட்டார் வாய்மொழி வழக்காறுகள்.

அலகு – II : பக்தி இலக்கியமும் சிற்றிலக்கியமும்: (12 மணிநேரம்)

அ). பக்தி இலக்கியம்(6 மணிநேரம்)

1. **1. சைவம்-** பெரியபுராணம் – இளையான்குடிமாறநாயனார் புராணம் -(**19 பாடல்கள்**)

(அம்பொன் நீடிய, கொண்டு வந்து, ஆளு நாயகர், செல்வம் மேவிய, மாரிக் காலத்து, ஈர மேனியை, நமக்கு முன்பிங்கு, செல்லல் நீங்க, மற்றம் மாற்றம், உள்ளம் அன்பு, காலினால் தடவி, வந்தபின் மனைவியாரும், முறித்தவை அடுப்பின், வழிவரும் இளைப்பினோடும், மனைவியார் கொழுநர், கணவனார் தம்மை, அழுந்திய இடருள், மாலயற் கரிய, அன்பனே அன்பர் பூசை)

2. வைணவம் – ஆண்டாள் நாச்சியார் திருப்பாவை: (**11 பாடல்கள்**)**:**மார்கழித்திங்கள், வையத்து வாழ்வீர்காள், ஓங்கி உலகளந்த, ஆழி மழைக்கண்ணா, மாயனை மன்னுவட மதுரை, சிற்றம் சிறுகாலே, ஒருத்தி மகனாய், மாலே மணிவண்ணா, கூடாரை வெல்லும், கறவைகள் பின்சென்று, வங்கக்கடல் கடைந்த.

ஆ). சிற்றிலக்கியம் (6 மணிநேரம்)

1. முக்கூடற் பள்ளு- 2 பாடல்கள் - சித்திரக் காலிவாலான் (நெல்வகைகள்)

குற்றாலத் திரிகூட மால்வரை (மீன் வகைகள்)

2. நந்தி கலம்பகம்- 5 பாடல்கள்- என்னையே புகழ்ந்தேன், பதிதொறு புயல்பொழி,

இந்தப்புவியில், அடிவிளக்கும் துகில், வானுறுமதியை

3. மதுரைச் சொக்கநாதர் தமிழ்விடு தூது –தமிழின் சிறப்பு பாடியருள பத்துப்பாட்டும்-விளம்பக்கேள்.

அலகு – III: கவிதையும்சிறுகதையும் (16 மணிநேரம்)

அ). கவிதை இலக்கியம் (8 மணிநேரம்)

1. மகாகவி பாரதியார் –கண்ணன் – என்சீடன்
2. புரட்சிக்கவிஞன் பாரதிதாசன் –இளையார் ஆத்திசூடி- அழுபவன் கோழை
3. கவிமணி தேசிக விநாயகம் பிள்ளை–கோயில் வழிபாடு
4. கவிக்கோ. அப்துல்ரகுமான் –பாருக்குள்ளே நல்ல நாடு
5. சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று
6. கவிஞர் தாமரை –தொலைந்து போனேன்
7. கவிஞர் கரிகாலன்– விடுதலை

ஆ). சிறுகதை இலக்கியம்(8 மணிநேரம்)

1. சாபவிமோசனம் – புதுமைப்பித்தன்
2. நகரம் –சுஜாதா
3. அந்நியர்கள் –ஆர். சூடாமணி
4. இந்நாட்டு மன்னர் –நாஞ்சில்நாடன்

அலகு – IV :உரைநடை இலக்கியம் (8 மணிநேரம்)

1. ஆளுமைத்திறன் அறிவோம் - தன்னம்பிக்கை மாத இதழிலிருந்து
2. திருக்குறளும் சமுதாயவியலும் – முனைவர் புரிசை நடராசன்
3. தமிழ் – உயர்தனிச் செம்மொழி – முனைவர் இரா. குணசீலன்
4. நொய்யல் – முனைவர் ப. தமிழரசி

அலகு- V :அடிப்படை இலக்கணமும் பயன்பாட்டுத்தமிழும்– II(7மணிநேரம்)

இலக்கணப் பயிற்சி: 1. அணி இலக்கணம்

உவமையணி-பிறிது மொழிதல் அணி-சிலேடை அணி-தீவக அணி-ஏகதேச உருவக அணி – வேற்றுமையணி–பின்வருநிலையணிக்கான விளக்கங்கள்.

2. **துறை சார் கலைச்சொல் பயன்பாட்டாக்கம்**
3. **படைப்பிலக்கியப் பயிற்சிகள்**
   1. மரபுக்கவிதை, புதுக்கவிதை, சிறுகதை, கட்டுரைபடைப்பாக்க உத்திகள்- பயிற்சிகள்
   2. எழுத்தாளருடனான நேர்காணல் மற்றும் கள ஆய்வுக்கான வினா நிரல் தயாரித்தல் நுட்பங்களும் பயிற்சிகளும்.
4. **மொழிபெயர்ப்புப்பயிற்சிகள்**
   1. தமிழ்-ஆங்கில மொழிபெயர்ப்புப் பயிற்சிகள் -2.
   2. ஆங்கிலம்-தமிழ் மொழிபெயர்ப்புப் பயிற்சிகள்-2.

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.

கற்பகம் உயர்கல்வி கலைக்கழகத்தமிழ்த்துறை வெளியீடு.

Semester – II

21ENU201 ENGLISH II 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective:

- To give basic knowledge on grammar.
- To train communication in real life situation.
- To be familiar with the four basic skills of English.
- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.
- To provide aesthetic pleasure through literature.
- To develop the moral values of students.

Course Outcome:

1. Retrieve fundaments of English language to construct error free sentences.
2. Develop the knowledge of interpersonal skills.
3. Establish and maintain social relationships.
4. Develop communication skills in business environment.
5. Refine communication competency through LSRW skills.
6. Introduce literature to enhance the moral and aesthetic values.

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UNIT –I – Grammar

Voice,Idioms and Phrases, Clauses and Reported Speech

UNIT –II –Business and Technical Reports

Business Correspondence –Memo, Notices, Agenda, Minutes- Resume Writing- Report Writing- Letter Writing- Personal and Social Letters- E-mail Writing

UNIT –III – Communication Practice

Verbal and Non-Verbal Communication- Group Discussion and Seminars- Note-Taking and Note-Making

UNIT –IV –LSRW Skills

Listening- Listening Talks and Presentations

Speaking - Public Speaking- Preparatory steps, Time Management, Handling Questions and Meeting unexpected situations

Reading - Language of Newspapers, Magazines and Internet

Writing -Writing Paragraphs and Essays- Content Writing

UNIT –V –Literature

Prose- Morals in the Indian Context by Francis Nicholas Chelliah

Poetry- Telephone Conversation by Wole Soyinka

Short Stories-The Last Leaf by O' Henry

Books for References

Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 CU Press

Sound Business, Julian Treasure 2012OUP

21CSU201 **Programming in Java** **Semester – II**
6H – 6C

Instruction Hours / week: L: 6 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

Upon completion of this course the student will be able to:

1. Obtain knowledge of the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Use the certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

Unit I - Introduction to Java

Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting.

Unit II - Arrays, Strings and I/O

Object-Oriented Programming Overview Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection-Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit III - Inheritance

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes.

Unit IV - Exception Handling and Database Connectivity

Exception types, uncaught exceptions, throw, built-in exceptions, creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Accessing and manipulating databases using JDBC.

Unit V – Java GUI Programming using Swing

Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts.

Suggested Readings

1. Herbert Schildt, Java the Complete Reference, 8th Edition.
2. ISRD Group, Introduction to object oriented programming through Java.
3. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley, 2014, The Java Language Specification, Java SE 8th Edition (Java Series), Published by Addison Wesley.
4. Joshua Bloch, 2008, Effective Java, 2nd Edition, Publisher: Addison-Wesley.
5. Cay S. Horstmann, Gary Cornell, 2012, Core Java 2 Volume 1 ,9th Edition, Printice Hall.
6. Cay S. Horstmann, Gary Cornell, 2013,Core Java 2 Volume 2 - Advanced Features, 9th Edition, Printice Hall.
7. Bruce Eckel, 2002, Thinking in Java, 3rd Edition, PHI.
8. E. Balaguruswamy, 2009, Programming with Java, 4th Edition, McGraw Hill.
9. Paul Deitel, Harvey Deitel, 2011, Java: How to Program, 10th Edition, Prentice Hall.
10. David J. Eck, 2009, Introduction to Programming Using Java, Published by CreateSpace Independent Publishing Platform.
11. John R. Hubbard, 2004, Programming with JAVA, Schaum's Series, 2nd Edition.
12. Ken Arnold, James Gosling, David Homes, 2005, The Java Programming Language, 4th Edition.

Websites

1. https://docs.oracle.com/java
2. https://www.tutorialspoint.com/java/index.htm
3. https://www.w3schools.com/java/
4. https://www.javatpoint.com/java-tutorial
5. https://docs.oracle.com/javase/tutorial/java/index.html
6. https://www.geeksforgeeks.org/java-tutorials/

NPTEL

7. https://nptel.ac.in/courses/106105191/

LMS

8. http://172.16.25.76/course/view.php?id=1827

21CSU202 **Discrete Structures** **Semester-II**
5H – 5C

Instruction Hours / week: L: 5 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

This course enables the students to learn

- The concepts of truth table and logical connectives and its properties.
- The basic concepts of sets, types of sets, functions and relations.
- About Pigeonhole principle, permutation and combination, mathematical induction.
- How to solve the problems using recurrence relations and generating functions.
- The basic concepts of graphs and its types.
- Basic terminology of trees and properties of trees.

Course Outcomes (COs)

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

1. Familiar with prepositional logic.
2. Acquire a fundamental understanding sets and functions.
3. Understand the concepts of mathematical induction.
4. Describe the method of recurrence relations.
5. Get wide knowledge about graphs and trees
6. Know about the concept of trees and its properties.

UNIT I

Prepositional Logic: Prepositions - Truth tables - Logical Connectives - Well formed Formulas -Demorgan's Law - Tautologies and Contradictions - PDNF and PCNF – Equivalences - Inference Theory - Rules of universal specification and generalization.

UNIT II

Sets: Introduction - Finite and infinite sets - Uncountably infinite sets - Relations and its types - Properties of Binary Relations – Closure - Partial Ordering Relations - Definition of Functions and its classification – Types of functions - Composition of functions.

UNIT III

Combinatorics: Pigeonhole principle - Permutation and Combination - Mathematical Induction - Principle of Inclusion and Exclusion.

UNIT IV

Recurrences: Recurrence Relations - Generating Functions - Linear Recurrence Relations with Constant Coefficients and their Solution.

UNIT V

Graph Theory: Introduction - Basic Terminology - Graph Representation - Types of graphs - Multigraphs and Weighted Graphs - Graph Isomorphism – Connectivity - Euler and Hamiltonian Paths and Circuits -Trees - Basic Terminology and Properties of Trees.

SUGGESTED READINGS

1. Kenneth Rosen., (2019). Discrete Mathematics and Its Applications (8th ed.), McGraw Hill Company, New Delhi.
2. Tremblay, J. P., and Manohar R., (2008). Discrete Mathematical Structures with Applications to Computer Science (1st ed.), McGraw-Hill Book Company, New Delhi.
3. Sharma J. K., (2011). Discrete Mathematics (Third Edition),Rajiv Beri for Macmillan Publishers India Ltd. New Delhi.
4. Dr. Singaravelu A., and Dr. Jeyaraman M.P., (2019). Discrete Mathematics, Meenakshi Agency Chennai.
5. Hein, J.L., (2010). Discrete Structures, Logic, and Computability (3rd ed.), Jones and Bartlett Publishers, New Delhi.
6. Hunter, D.J. (2016). Essentials of Discrete Mathematics (3rd ed.). Jones and Bartlett Publishers, New Delhi.

Website Links:

1. https://youtu.be/u4IQh46VoU4
2. https://youtu.be/fZqfkJ-cb28
3. https://www.youtube.com/watch?v=6WGWFwgXhd4
4. https://www.youtube.com/watch?v=HmQR8Xy9DeM
5. https://www.youtube.com/watch?v=_-QZQNSmIpw

Semester – II

21CSU211 Programming in Java - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Programs

1. To convert a decimal to binary number
2. Write a program to find the sum of series $1+x+x^2+x^3+$……..
3. To find the sum of any number of integers entered as command line arguments
4. To learn use of single dimensional array by defining the array dynamically.
5. Write a program to find maximum and sum of an array
6. Write a Program to generate Fibonacci Series and Factorial for a number
7. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
8. Write a program to an exception out of bounds, if mark is greater than 100 throw an exception
9. Write a program ―DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
10. Write a program to generate multiplication table by multithreading
11. Write a program to demonstrate priorities among multiple threads
12. Write a program to perform string operations

Suggested Readings

1. Herbert Schildt, 2014, Java Complete Reference, 9th Edition, Tata McGraw Hill, New Delhi.
2. ISRD Group, 2007, Introduction to Object Oriented Programming through Java, 1st Edition, Tata McGraw Hill, New Delhi
3. Deitel H.M. and P.J.Deitel, 2005, Java-How to Program, 6th Edition, Pearson Education, New Delhi.
4. Dr.S Somasundaram, 2004, Java Programming**,** 1st Edition, Techmedia. New Delhi.
5. E.Balagurusamy, 2010, Programming with Java – A Primer, 4th Edition, Tata McGraw Hill, New Delhi.

Web Sites

1. www.java.sun.com
2. www.knking.com
3. www.webdeveloper.com
4. www.forums.sun.com
5. www.netbeans.com
6. java.sun.com/docs/books/tutorial/
7. www.java.net/

Semester – II

21CSU212 Discrete Structures - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

This course enables the students

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)

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

1. Familiarize with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis.

List of Programs

1. Write a C Program to find the number of subsets of a set contains n elements.
2. Write a C Program to find transitive closure of a relation.
3. Write a C Program to prove
   1/ (1*2) + 1/(2*3) ……+1/(n(n+1)) = n/(n+1)
4. Write a C Program to to perform the sum = 1+ (1+2) + (1+2+3) + … + (1+2…+n)
5. Write a C program to print Fibonacci series till Nth term using recursion
6. Write a Cprogram in c to calculate factorial of a number using recursion
7. Write a C Program to find a minimum spanning tree using Prim's algorithm
8. Write a C program to find the shortest path with the lower cost in a graph using Dijkstra's Algorithm
9. Write a C Program to construct the truth table for the following formula.
   (i) P∧ Q∧⌉R (ii) P∧⌉Q∧ R (iii) P∧ Q∧⌉R
10. Write a C Program to prove De – Morgan's law.

Suggested Readings

1. Kenneth Rosen. (2006). Discrete Mathematics and Its Applications (6th ed.). McGraw Hill, New Delhi.
2. Tremblay , J .P. , & Manohar, R. (1997). Discrete Mathematical Structures with Applications to Computer Science. McGraw-Hill Book Company, New Delhi.
3. Coremen, T.H., Leiserson, C.E. , & R. L. Rivest. (2009). Introduction to algorithms, (3rd ed.). Prentice Hall on India, New Delhi.
4. Albertson, M. O.,& Hutchinson, J. P. (1988). Discrete Mathematics with Algorithms .: John wiley Publication, New Delhi.

5. Hein, J. L. (2009). Discrete Structures, Logic, and Computability(3rd ed.). Jones and Bartlett Publishers, New Delhi.
6. Hunter, D.J. (2008). Essentials of Discrete Mathematics. Jones and Bartlett Publishers, New Delhi.

Semester – II

21AEC201 Environmental Studies 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To encourage to learn ecosystems and biodiversity.
- To learn environment pollution and control measures of pollution.
- To create system concepts and methodologies and analyze interactions.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Unit I – Introduction - Environmental Studies & Ecosystems

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, Grassland Ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit II - Natural Resources - Renewable and Non-Renewable Resources

Natural resources - Renewable and Non – Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources - Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water resources - Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water. Use of alternate energy sources, growing energy needs, case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit III - Biodiversity and its Conservation

Levels of biological diversity - genetic, species and ecosystem diversity.Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India. Biodiversity patterns (global, National and local levels).

Hot-spots of biodiversity. India as a mega-diversity nation. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV - Environmental Pollution

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution. Nuclear hazards and human health risks. Solid waste management and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Case studies.

Unit V - Social Issues and the Environment

Concept of sustainability and sustainable development. Water conservation - Rain water harvesting, watershed management. Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture. Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act). International agreements (Montreal and Kyoto protocols). Resettlement and rehabilitation of project affected persons. Disaster management (floods, earthquake, cyclones and landslides). Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Human population growth: Impacts on environment, human health and welfare.

Suggested Readings

1. Anonymous. 2004. A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
2. Anubha Kaushik., and Kaushik, C.P. 2004. Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.
3. Arvind Kumar. 2004. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
4. Daniel, B. Botkin., and Edward, A. Keller. 1995. Environmental Science John Wiley and Sons, Inc., New York.
5. Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S.Chand & Company Pvt. Ltd., New Delhi.
6. Odum, E.P., Odum, H.T. and Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
7. Rajagopalan, R. 2016. Environmental Studies: From Crisis to Cure, Oxford University Press**.**
8. Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
9. Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
10. Tripathy. S.N., and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.). Vrianda Publications Private Ltd, New Delhi.
11. Verma, P.S., and Agarwal V.K. 2001. Environmental Biology (Principles of Ecology). S. Chand and Company Ltd, New Delhi.
12. Uberoi, N.K. 2005. Environmental Studies. Excel Books Publications, New Delhi.

Semester – III

21CSU301 Data Structures 4H – 4C

Instruction Hours / week: L:4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms
- To develop application using data structures
- To choose appropriate data structures and algorithms for problem solving.

Course Outcomes (COs)

Upon completion of this course, the student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear and non-linear data structures to problem solutions.
3. Analyze the applications of tree.
4. Implement graph theory over various data structures.
5. Critically analyze the various sorting algorithms.
6. Apply hashing technique for various applications.

Unit I

Abstract Data Types – **List** – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

Unit II

Stack Introduction – Operations – Applications – Evaluating arithmetic expressions- Conversion of Infix to postfix expression – **Queue** Introduction – Operations – Circular Queue – Priority Queue – deQueue – applications of queues.

Unit III

Tree – Introduction-Tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

Unit IV

Graphs Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

Unit V

Searching- Linear Search – Binary Search. **Sorting** – Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort-Heap Sort-Quick Sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Suggested Readings

1. R. S. Salaria (Author)-Data Structures and Algorithms using C, Khanna Publishing, Fifth Edition - 2018

2. Reema Thareja, ―Data Structures Using C‖, Second Edition , Oxford University Press, 2011
3. Mark Allen Weiss. (2011). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
4. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). Wiley.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
6. Sartaj Sahni. (2011). Data Structures, Algorithms and applications in C++(2nd ed.). Universities Press.

Websites

1. http://en.wikipedia.org/wiki/Data_structure
2. http://www.cs.sunysb.edu/~skiena/214/lectures/
3. www.amazon.com/Teach-Yourself-Structures-Algorithms

Semester – III

21CSU302 Relational Database Management Systems 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To have an introductory knowledge about the PL/SQL concept
- To design and create an effective and efficient database for various real time applications.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Demonstrate an understanding of the elementary features of RDBMS
2. Design conceptual models of a database using ER modeling for real life applications
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database
4. Able to develop structured query language (SQL) queries to create, read, update, and delete relational database
5. Design efficient PL/SQL programs to access Oracle databases
6. Design and create an effective and efficient database for various real time applications.

Unit I – Introduction

Introduction to DBMS – Information-Data and Data Management-File-based data management – Database System - DBMS - Components of a DBMS- Database User-Database Architecture and Design- Data Abstraction - Physical and Logical Data Independence

Unit II - Data Models

Data Models-Introduction-Conceptual, Physical Models-Hierarchical Model - Network Model-Relational Model – E-R Model- Entity – Relationship (E-R) Modeling : Introduction – E-R Model - Components of an E-R Model-Relationships- Relationships, E-R conventions-Composite Entities - Entity List-E-R diagrams, E-R Modeling Symbols

Unit III - Relational Database Design

Data Integrity, Constraints and Normalization: Introduction-Integrity Constrains - Normalization-Keys-Relationships-Normalization - Keys-Relationships-First Normal Form(1NF)-Second Normal form(2NF) -Third Normal Form(3NF)- Boyce-Codd Normal Form (BCNF)

Unit IV - SQL Concepts

Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins)

Unit V - PL/SQL Concepts

Introduction to PL/SQL-Variable-Constants-Conditional Statements-Cursor-Implicit Cursors-PL/SQL Explicit Cursors - PL/SQL Procedures - PL/SQL Functions - PL/SQL Exception Handling PL/SQL Triggers

Suggested Readings

1. Elmasri Ramez and Navathe Shamkant , 'Fundamentals of Database System', Pearson Education , Sixth Edition,2017
2. Abraham Silberschatz , Henry F.Korth and S.Sudarshan,'Database System Concepts', Tata Mc
3. Graw Hill,Sixth Edition,2015.
4. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Pearson Education ,Eighth Edition 2012
5. Parteek Bhatia,'PL/SQL for Beginners: A Simplified Approach (Kindle Edition) ,2016
6. Ivan Bayross,'SQL, PL/SQL the Programming Language of Oracle Paperback',BPB Publication, Fifth Edition, 2015.

Websites

1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.javatpoint.com/dbms-sql-introduction
4. www.databasedir.com
5. http://plsql-tutorial.com/

Semester – III

21CSU303 Operations Research 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- Learn the basic concepts of linear programming
- Learn the applications of linear programming.
- Impart knowledge in concepts
- Usage the tools of operations research.
- Know the constructive techniques
- Learn to make effective business decisions

Course Outcomes (COs)

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

1. Understand the basic concepts and application of operation research in various fields.
2. Understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively
3. Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry
4. Identify and develop operational research models from the verbal description of the real system
5. Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
6. Understand the Big M Method

UNIT I

Linear Programming - Mathematical Model assumption of linear Programming –Graphical method - Principles of Simplex method- Big-M Method- Duality in LPP.

UNIT - II

Transportation Model: Introduction – Mathematical Formulation –Finding Initial Basic Feasible Solutions – Optimum Solution for Non degeneracy and Degeneracy Model - Unbalanced Transportation Problems and Maximization case in Transportation Problem.

UNIT- III

The Assignment problem : Mathematical Formulation of the Problem – Hungarian Method – Unbalanced Assignment Problem- Maximization Case in Assignment Problem - Travelling Salesman Problem.

Queuing Theory : Introduction – Characteristics of Queuing System. Problems in (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) models .

UNIT - IV

Inventory Control: Introduction – Costs involved in Inventory – Deterministic EOQ Models – Purchasing Model without and with Shortage, Manufacturing Model without and with Shortage - Price Break.

UNIT V

PERT AND CPM

Introduction - Network scheduling by PERT / CPM – Network and basic components –Rules of Network construction – Time calculation in Networks – CPM.

PERT – PERT calculations – Cost Analysis – Crashing the Network – Problems.

SUGGESTED READINGS

1. Kandiswarup, P. K. Gupta and Man Mohan (2011), Operations Research, 12th Revised edition, S. Chand & Sons Education Publications, New Delhi.
2. S.D. Sharma (2017), Operations Research Theory, Methods & Applications, Kedar Nath Ram Nath Publications, India.
3. Hamdy A. Taha (2012), Operations Research-An Introduction, Nineth edition, published by Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
4. Prem Kumar Gupta and D. S. Hira (2014), Operations Research , S. Chand & Company Ltd, Ram Nagar, New Delhi.
5. G. Srinivasan (2017) ,Operations Research: Principles and Applications, PHI, NewDelhi

Websites

1. https://youtu.be/vUMGvpsb8dc
2. https://youtu.be/ItOuvM2KmD4

Semester – III

21CSU304A **Programming in Python** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To Learn Syntax and Semantics and create Functions in Python.
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications
- To develop real time applications using Python

Course Outcomes (COs)

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

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python Programs.
6. Develop applications real time applications using Python

Unit I -Python Overview, Data Types, Expressions

Python programming - variable, Datatype, Keywords, Literals, Operator, Expression, type conversion, Comments, input and output, Strings, Assignment and Comments - Numeric Data Types and Character Sets, Expressions, Python Casting.

Unit II - Functions, Modules and Control Statements

Functions and Modules - Calling Functions, The math Module, The Main Module, Program Format and Structure and Running a Script from a Terminal Command Prompt - Iteration - for loop - Selection - Boolean Type, Comparisons, and Boolean Expressions, if-else Statements, One-Way Selection Statements, Multi-way if Statements, Logical Operators and Compound Boolean Expressions, Short- Circuit Evaluation and Testing Selection Statements - Conditional Iteration - while loop

Unit III -Strings and Text Files

Strings - Accessing Characters and Substrings in Strings, Data Encryption, Strings and Number Systems and String Methods - Text Files - Text Files and Format, Writing Text to a File, Writing Numbers to a File, Reading Text from a File, Reading Numbers from a File and Accessing and Manipulating Files and Directories on Disk.

Unit IV -Lists and Dictionaries

Lists - List Literals and Basic Operators, Replacing an Element in a List, List Methods for Inserting and Removing Elements, Searching and Sorting a List, Mutator Methods and the Value None, Aliasing and Side Effects, Equality and Tuples - Defining Simple Functions - Syntax, Parameters and Arguments, return Statement, Boolean Functions and main function, dictionaries - Dictionary Literals, Adding Keys and Replacing Values, Accessing Values, Removing Keys and Traversing a Dictionary.

Unit V - Design with Functions and Classes, Graphical User Interface

Design with Functions and Design with Classes - Functions as Abstraction Mechanisms, Design with Recursive Functions and Managing a Program's Namespace Data Modeling and Structuring Classes with Inheritance and Polymorphism, Behavior of terminal based programs and GUI based programs- Coding simple GUI based programs- Other useful GUI resources- Case Study: GUI based ATM.

Suggested Readings

1. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python: First Programs, Cengage Learning", second edition, 2018, ISBN 13:978-1337560092.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
7. Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
8. Charles Dierbach, ―Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.
9. Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

Websites

1. https://www.learnpython.org/
2. https://www.codecademy.com/learn/learn-python
3. https://docs.python.org/3/tutorial/
4. https://runestone.academy/runestone/books/published/thinkcspy/index.html
5. https://nptel.ac.in/courses/106106182/
6. http://172.16.25.76/course/view.php?id=1225

Semester – III

21CSU304B Scripting Languages 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 Marks: Int :**40** Ext : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To classify the various Scripting Languages.
- To learn client and server side scripting languages (VB Script,Java script and AJAX, JSP).
- To create simple Web pages and provide client side validation.
- To create dynamic web pages using server side scripting
- To get exposure in JDBC and EJB
- To design and create a website with client and server side technologies.

Course Outcomes (Cos)

At the end of the course, the student should be able to:

1. Define the CSS with its types and use them to provide the styles to the web pages at various levels.
2. Develop the modern web pages using the HTML and CSS features with different layouts as required in applications.
3. Use the JavaScript to develop the dynamic web pages.
4. Use server side scripting with JSP to generate the web pages dynamically.
5. Use JDBC and EJB concepts along with AJAX technologies.
6. Design and create a website with client and server side technologies.

Unit I

Introduction To VB script: Introduction- Embedding VBScript Code in an HTML Document Comments-Variables- Operators-Procedures- Conditional Statements- Looping Constructs - VBScript Events - Objects and VBScript – Cookies.

Unit II

Introduction to JavaScript: JavaScript- Introduction, simple programming, Obtaining User Input with prompt Dialogs, Operators (arithmetic, Decision making, assignment, logical, increment and decrement. Functions - program modules in JavaScript, programmer defined functions, function definition, Random-number generator, scope rules, global functions, and recursion.

Unit III

Functions, Arrays and Objects: JavaScript: Arrays, Objects - Math Object, String Object, Date Object, Boolean & Number Object, document and window Objects. Handling event using java script

Unit IV

Client Side Technologies :AJAX– Evolution of AJAX – AJAX Framework – Web applications with AJAX – AJAX with PHP – AJAX with Databases- Ajax Client Server Architecture-XML Http Request Object-Call Back Methods.

Unit V

Server Side Scripting- JSP: Servlet Overview – Life cycle of a Servlet – Handling HTTP request and response – Using Cookies – Session tracking – Java Server Pages – Anatomy of JSP

– Implicit JSP Objects – JDBC – Java Beans – Advantages – Enterprise Java Beans – EJB Architecture – Types of Beans – EJB Transactions

Suggested Readings

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Deitel, Deitel, Goldberg, “Internet & World Wide Web How to Program”, Fourth Edition, Pearson Education, 2008.
3. Bryan Basham, Kathy Siegra, Bert Bates, “Head First Servlets and JSP”, Second Edition
4. Uttam K Roy, “Web Technologies”, Oxford University Press, 2011.
5. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition,Pearson Education, 2012 .
6. Marty Hall and Larry Brown,‖ Core Web Programming‖ Second Edition, Volume I and II, Pearson Education, 2001.

Websites

1. https://www.tutorialspoint.com/vbscript/index.htm
2. https://www.w3schools.com/js/
3. https://www.javatpoint.com/ajax-tutorial
4. https://www.javatpoint.com/servlet-tutorial
5. https://www.javatpoint.com/jsp-tutorial

Semester – III

21CSU311 Data Structures - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms
- To develop application using data structures
- To choose appropriate data structures and algorithms for problem solving.

Course Outcomes (COs)

Upon completion of this course, the student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear and non-linear data structures to problem solutions.
3. Analyze the applications of tree.
4. Implement graph theory over various data structures.
5. Critically analyze the various sorting algorithms.
6. Apply hashing technique for various applications.

List of Programs

1. Write a program to search an element from a list. Give user the option to perform Linear and Binary search.
2. Give user the option to perform sorting using Insertion sort, Bubble sort and Selection sort.
3. Implement singly Linked List Include functions for insertion, deletion and search of a number, reverse the list.
5. Perform Stack operations using Linked List implementation.
6. Perform Stack operations using Array implementation.
7. Perform Queues operations using Array implementation.
7. Perform Queues operations using Linked List.
8. WAP to scan a polynomial using linked list and add two polynomial.
9. WAP to create a Binary Search Tree and include following operations in tree:
   (a) Insertion
   (b) Deletion
   (c) Search a no. in BST
10. Program to implement Graph Traversal Techniques.

Suggested Readings

1. R. S. Salaria (Author)-Data Structures and Algorithms using C, Khanna Publishing, Fifth Edition - 2018
2. Reema Thareja, ―Data Structures Using C‖, Second Edition , Oxford University Press, 2011
3. Mark Allen Weiss. (2011). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
4. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). Wiley.

5. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
6. Sartaj Sahni. (2011). Data Structures, Algorithms and applications in C++(2nd ed.). Universities Press.

Websites

1. http://en.wikipedia.org/wiki/Data_structure
2. http://www.cs.sunysb.edu/~skiena/214/lectures/
3. www.amazon.com/Teach-Yourself-Structures-Algorithms

Semester – III

21CSU312 Relational Database Management Systems - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To give good understanding of the fundamental RDBMS used in computer science.
- Able to understand various queries and their execution
- To develop an understanding of essential RDBMS concepts such as: database security and integrity
- To use DCL and TCL effectively.
- To present the concepts of relational algebra and Joins in SQL
- To present the concepts of Cursor, Trigger and Exceptions in PL/SQL

Course Outcomes (COs)

Upon completion of this course the student will be able to:

1. Design and implement a database schema for a given problem domain
2. Populate and query a database using SQL DML/DDL commands.
3. Create and populate a RDBMS for a real-life application, with constraints and keys
4. Effectively use DCL and TCL commands.
5. Develop program in PL/SQL including Stored Procedures and Stored Functions
6. Develop program in PL/SQL including Cursors and Packages

List of Programs

1. To implement Data Definition language
2.To implement Data Manipulation language
3. To implementation on DCL and TCL
4. To implement the following Constraints
   (a). Primary key
   (b). Foreign Key
   (c). Check
   (d). Unique
   (e). Null
   (f) Not null
5. Create a table with following fields:

Employee table:

Field name	Constraint	Type	Size
Employee_no	Primary key	Character	6
Employee_name		Character	30
Address		Character	25
Designation		Character	15
Dob		Date	
Gender	Check	Character	1
Doj		Date	
Salary		Number	10,2

Queries:

a) Display name of the employees whose salary is greater than “10,000”.
b) Display the details of employees in ascending order according to Employee Code

c) Display the details of employees earning the highest salary
d) Display the names of employees who earn more than "Ravi".

6. Create table named Student with following fields and insert the values:

Field name	field type	field size
Student Name	**Character**	15
Gender	**Character**	6
Roll No.	**Character**	10
Department Name	**Character**	15
Address	**Character**	25
Percentage of marks	**Number**	4,2

Queries:

a) Calculate the average mark percentage of the students
b) Display the names of the students whose percentage marks are greater than 80%
c) Display the details of the students who got the highest percentage of marks
d) Display the details of the students whose mark percentage between 50 and 70
e) Display the details of the students whose mark percentage is greater the mark percentage of Roll No=12CA01

7. Create a table with following fields:

Staff table:

Field name	Constraint	Type	Size
Staff_no	Primary key	Character	6
Staff_name		Character	30
Dob		Date	
Dept_code	Foreign key	Character	4
Designation		Character	15
Basic		Number	7,2

Department table:

Field name	constraint	Type	Size
Dept_code	Primary key	Character	4
Dept_name		Character	30

Execute the following queries:

1. To list the staff who joined 2 years back.
2. To list the staff in computer science dept.
3. To list the staff_name and the dept_name in which he/she works.
4. To list the maximum and minimum salary in each dept.
5. To list the dept along with the total amount spent on salary
6. To list the name of the employees who draw the salary more than the average salary.

8.Create a table with the following fields:

Book table:

Field name	Constraint	Type	Size
Access_no	Primary key	Character	6
Title		Character	30
Author		Character	30
Publisher		Character	30

Subject		Character	10
Price		Number	6,2

Execute the following queries:

1. The title of C and C++ books.
2. The books written by a particular author.
3. The books which costs between Rs.300/- and Rs.500/-
4. The number of books available in each subject.
5. The books in the decreasing order of the cost.

9.Create a table with the following fields:

Account table:

Field name	Constraint	Type	Size
Acc_no	Primary key	Number	4
Cust_name		Varchar2	30
Branch_name		Varchar2	30
Cust_city		Varchar2	30

Borrower table:

Field name	Constraint	Type	Size
Acc_no	Foreign key	Number	30
Branch_name		Varchar2	30
Amount		Number	8,2

Write queries to perform different types of Join.

10.Write a PL/SQL block to create and handle User Defined Exception

clientmaster

Field name	Constraint	Type	Size
Client_id		Number	6
Client_name		Varchar2	30
Address		Varchar2	50
Phone		Number	10
Balance		Number	10,2

11. Create table with following fields:

Product table:

Field name	Constraint	Type	Size
Product_code	Primary key	Varchar2	7
Product_name		Varchar2	30
Price		Number	6,2
Quantity		Number	4

Vendor table:

Field name	Constraint	Type	Size
Vendor_name		Varchar2	30
Vendor address		Varchar2	30
Product_code	Foreign Key	Varchar2	7

Create a Trigger to fire when the Record is deleted and inserted.

12. Write a PL/SQL trigger to update the records while deleting the one record in another table.

Voters_master:

Field name	Constraint	Type	Size
Voterid	Primary key	Number	5
Name		Varchar2	30
Ward_no	Primary Key	Number	4
Dob		Date	
Address		Varchar2	150

New_list

Field name	Constraint	Type	Size
Voterid		Number	5
Ward_no		Number	4
Name		Varchar2	30
Description		Character	50

13. Create a table to store the salary details of the employees in a company. Declare the Cursor id to contain empno, employee name and net salary. Use cursor to update the employee details.

Salary:

Field name	Constraint	Type	Size
Emp_no	Primary key	Number	4
Emp_name		Varchar2	30
Designation		Varchar2	25
Dept		Varchar2	30
Basic		Number	5

14. Create a table stock contains the itemcode varchar2(10), itemname varchar2(50), current_stocknumber(5), date_of_last_purchase date. Write a stored procedure to seek for an item using itemcode and delete it, if the date of last purchase is before 1 year from the current date. If not, update the curent stock.

15. Create a Package in PL/SQL

Reference Books

1. Elmasri Ramez and Navathe Shamkant , 'Fundamentals of Database System', Pearson Education , Sixth Edition,2017
2. Abraham Silberschatz , Henry F.Korth and S.Sudarshan,'Database System Concepts', Tata McGraw Hill,Sixth Edition,2015.
3. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Pearson Education ,Eighth Edition 2012
4. Parteek Bhatia ,'PL/SQL for Beginners: A Simplified Approach (Kindle Edition) ,2016
5. Ivan Bayross ,'SQL, PL/SQL the Programming Language of Oracle Paperback',BPB Publication, Fifth Edition, 2015.

Websites

1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.javatpoint.com/dbms-sql-introduction
4. www.databasedir.com
5. http://plsql-tutorial.com/

Semester – III

21CSU313 Operations Research - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

This course enables the students

- To solve LPP using computer language.
- To know problem- solving through (computer language) programming.
- To solve Transportation and Assignment Problems
- To understand the usage of game theory and Simulation for Solving Business Problems
- To model a dynamic system as a queuing model and compute important performance measures
- To develop the skills in the use of Operations Research approaches and computer tools in solving real problems in industry.

Course Outcomes (COs)

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

1. Familiarize with the programming environment for operations research.
2. Understand the mathematical concepts using in computer programming techniques.
3. Understand variety of problems such as assignment, transportation, travelling salesman etc.
4. Understand different queuing situations and find the optimal solutions using models for different situations.
5. Be able to design new simple models, like: CPM, MSPT to improve decision –making and develop critical thinking and objective analysis of decision problems
6. Develop mathematical models for analysis of real problems in Operations Research

List of Practical (Using any software)

1. Simplex method.
2. North West Corner Rule.
3. Assignment problem.
4. EOQ for purchasing model without shortage
5. EOQ for manufacturing model without shortage
6. EOQ for manufacturing model with shortage
7. EOQ for purchasing model with shortage
8. Calculate the L_s,W_s for M/M/1:(∞/FIFO).
9. Calculate the L_q,W_q for M/M/1:(∞/FIFO)
10. To calculate the L_s for M/M/1:(N /FIFO)

Semester – III

21CSU314A Programming in Python - Practical 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To Learn Syntax and Semantics and create Functions in Python.
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications
- To Use Python interactively

Course Outcomes (COs)

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

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python Programs.
6. Implement database and GUI applications

List of Programs

1. Write a python program using Control statements
2. Write a python program using Functions and String Operations
3. Write a python program using List, Tuples and List comprehensions
4. Write a python program using Inheritance
5. Write a python program using Synchronization
6. Write a python program using Text Files
7. Write a python program using Graphical user Interfaces
8. Write a python program using Exceptional Handling
9. Write a python program using Classes and Objects
10. Write a python program using Chat Applications

Suggested Readings

1. Kenneth A. Lambert, Martin Osborne, “Fundamentals of Python: First Programs, Cengage Learning”, second edition, 2018, ISBN 13:978-1337560092.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

6. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
7. Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
8. Charles Dierbach, ―Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.
9. Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013

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1. https://www.learnpython.org/
2. https://www.codecademy.com/learn/learn-python
3. https://docs.python.org/3/tutorial/
4. https://runestone.academy/runestone/books/published/thinkcspy/index.html

Semester – III

21CSU314B Scripting Language - Practical 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To classify the various Scripting Languages.
- To learn client and server side scripting languages (VB Script,Java script and AJAX, JSP).
- To create simple Web pages and provide client side validation.
- To create dynamic web pages using server side scripting
- To get exposure in JDBC and EJB
- To design and create a website with client and server side technologies.

Course Outcomes (Cos)

At the end of the course, the student should be able to:

1. Define the CSS with its types and use them to provide the styles to the web pages at various levels.
2. Develop the modern web pages using the HTML and CSS features with different layouts as required in applications.
3. Use the JavaScript to develop the dynamic web pages.
4. Use server side scripting with JSP to generate the web pages dynamically.
5. Use JDBC and EJB concepts along with AJAX technologies.
6. Design and create a website with client and server side technologies.

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List of Programs

1. Create Application form using various text formats.
2. Create UNIVERSITY website using HTML tags.
3. Create a table using HTML.
4. Display your information using form controls.
5. Create style sheets with the style elements.
6. Create calculator format using java script.
7. Create an array of 10 numbers and sort them using javascript.
8. String manipulation using string object.
9. Add a simple script using Click event.
10. Create Employee details using schemas.
11. Create our department details using CSS.
12. Create Payroll system using XSL.
13. Changing image using mouseover event.
14. Create a website for a newspaper.
15. Design and apply your application form for course enrolment using Javascript.

Suggested Readings

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Deitel, Deitel, Goldberg, “Internet & World Wide Web How to Program”, Third Edition, Pearson Education, 2006.
3. Bryan Basham, Kathy Siegra, Bert Bates, “Head First Servlets and JSP”, Second Edition
4. Uttam K Roy, “Web Technologies”, Oxford University Press, 2011.

5. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition,Pearson Education, 2007 .
6. Marty Hall and Larry Brown,‖ Core Web Programming‖ Second Edition, Volume I and II, Pearson Education, 2001.

Semester – II

21CSU401 Operating Systems 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To Study the basic concepts and functions of operating systems.
- To understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency, Deadlocks and Memory Management
- To Learn about the Protection and Security Concepts.
- Understand basic resource management techniques.

Course Outcomes (COs)

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

1. Design various Scheduling algorithms.
2. Apply the principles of concurrency.
3. Design deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Apply the Security Concepts based on Authentication.
6. Understand about various Malicious Softwares

Unit I - Introduction to Operating System

Basic OS Functions-Resource Abstraction-Types of Operating Systems–Multiprogramming Systems-Batch Systems-Time Sharing Systems- Operating Systems for Personal Computers & Workstations-Process Control & Real Time Systems.

Unit II - Operating System Organization

Processor and user modes-Kernels-System Calls and System Programs. Process Management**:** System view of the process and resources- Process Abstraction-Process Hierarchy-Threads-Threading Issues-Thread Libraries-Process Scheduling-Non Pre-emptive and Preemptive scheduling algorithms-Concurrent and processes-Critical Section-Semaphores-Methods for inter-process communication- Deadlocks.

Unit III - Memory Management

Physical and Virtual address space-Memory Allocation strategies –Fixed and Variable partitions-Paging-Segmentation-Virtual memory.

Unit IV - File and Disk Scheduling

File Management: File and File Systems – File Operations - File Structure – File Organization Types – File Allocation Methods. Directory Structure: Naming – Tree Structure Directory. Disk Scheduling: FIFO – SSTF – SCAN – C- SCAN.

Unit V- Protection and Security

Container Architecture - Authentication: Password-Based Authentication – Token – Based Authentication – Biometric Authentication. Access Control: Discretionary Access Control – Role - Based Access Control. Malicious Software Overview: Backdoor – Logic Bomb – Trojan horse. Viruses.

Suggested Readings

1. Silberschatz, A ., Galvin, P.B. , &Gagne,G.(2018). Operating Systems Concepts, 10th ed..New Delhi: John Wiley Publications.
2. Stallings, W.(2013). Operating Systems, Internals & Design Principles (7th ed.). New Delhi: Prentice Hall of India.
3. Jose M Garrido , Richard Schlesinger Kenneth Hoganson (2013). Principles of Modern Operating Systems,2nd edition,Library of Congress Cataloging-in-Publication Data.

Websites

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/
4. www.nptel.ac.in/operating systems.
5. http://172.16.25.76/course/view.php?id=1906

Semester – IV

21CSU402 Software Engineering and Testing 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks,
- To estimate cost and time for a software engineering process.
- To expose the criteria for test cases.
- Be familiar with test management and test automation techniques

Course Outcomes (COs)

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

1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Create appropriate test cases for software engineering process.
6. Develop software projects based on current technology, and test the software using testing tools.

Unit I – Introduction

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

Unit II - Requirement Analysis

Initiating Requirement Engineering Process- Requirement Analysis and Modeling Techniques- Flow Oriented Modeling- Need for SRS- Characteristics and Components of SRS- Software Project Management: Estimation in Project Planning Process, Project Scheduling.

Unit III - Risk Management & Design Engineering

Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, Metrics for Process and Projects- Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

Unit IV - Testing Strategies & Tactics

Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing- Performance Testing-Stress Testing – Scalability Testing – Soak Testing-Spike Testing. Agile Testing Functional testing concepts, Equivalence class partitioning, Boundary value analysis, Decision tables, Random testing, Error guessing.

Unit V - Automation Testing Basics

Introduction of selenium- Selenium components- Overview of the Testing framework- Selenium Architecture- Selenium Features- Selenium IDE- IDE-Features- IDE Commands - IDE-First Test Case-Selenium Web Driver- Web Driver-Architecture- Web Driver-Features- WebDriver Commands- Locating Strategies

Suggested Readings

1. Pressman, R.S. (2014). Software Engineering: A Practitioner‘s Approach. 7th edition. New Delhi: McGraw-Hill.
2. Jalote, P. (2012). An Integrated Approach to Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
3. Aggarwal, K.K., & Singh, Y. (2012). Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
4. Sommerville, I. (2006). Software Engineering. 8th edition. New Delhi: Addison Wesley.
5. Aditya P. Mathur, Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
6. Agile Testing: A Practical Guide for Testers and Agile Teams - Lisa Crispin and Janet Gregory.
7. Software Testing: A Craftsman’s Approach, Fourth Edition.
8. Effective Methods for Software Testing – William E Perry- Third Edition.
9. Boris Beizer, Software Testing Techniques – 2nd Edition, Van Nostrand Reinhold, New York.

Websites

1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.CSU.gatech.edu/classes/AY2000/cs3802_fall/
4. https://www.javatpoint.com/selenium-tutorial
5. https://nptel.ac.in/courses/106105087/

Semester – IV

21CSU403 Business Accounting 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

COURSE OBJECTIVES:

- To make the students learn the basic concepts, conventions, nature of accounting
- To know about the accounting process
- To prepare the final accounts of a sole trader.
- To understand the cost concepts, types of costing and preparation of cost sheet.
- To understand the concepts of management accounting
- To compute financial statement analysis

COURSE OUTCOMES:

1. Comprehend the accounting concepts.
2. Principles and to comply the accounting standards.
3. Prepare the final accounts of a sole trader.
4. Know the cost concepts, types of costing and preparation of cost sheet.
5. Understand the concepts of management accounting
6. Compute financial statement analysis

UNIT I

Fundamentals of Accounting - Accounting – Need – Objectives – Advantages – Limitations - Users of Accounting – Functions - Book Keeping - Methods of Accounting - Accounting Concepts - Accounting Conventions -Accounting Cycle - Branches of Accounting - Basis of Accounting

UNIT II

Journal and Ledger: Journal- General format - Objectives - Ledger folio – Ledger – Proforma of Ledger account – Posting of Accounts – Trial Balance – Subsidiary books – Cash Book.

UNIT- II

Final Accounts - Trading Account – Proforma - Profit and Loss Account - Balance Sheet - Adjusting Entries. (Simple Problems only)

UNIT IV

Cost Accounting – Meaning - Objectives - Advantages of Cost Accounting - Difference Between Cost Accounting and Financial Accounting - Cost Concepts and Classifications - Elements of Cost - Installation of a Costing System - Role of a Cost Accountant in an Organization - Preparation of Cost sheet.

UNIT V

Management Accounting – Introduction – Meaning – Objectives - Nature and Scope of Management Accounting - Difference between Cost Accounting and Management Accounting - Cost management. Preparation of Financial Statements Analysis – Comparative and Common size Statements – Trend analysis.

SUGGESTED READINGS

1. Shukla,M.C. Grewal T.S. Gupta. S.C. (2016) , Advanced Accounts. Vol.-I., 19th Edition, S. Chand & Co., New Delhi.
2. Dr S N Maheshwari & Dr Suneel K Maheshwari (2018), *Problems and Solutions in Advanced Accountancy* . 6th edition, Vikas Publishing House, New Delhi
3. S.P. Jain and K.L.Narang (2016) Advanced Accountancy Principles of Accounting, Kalyani Publishers, Ludhiana
4. SP Jain and KL Narang, Simmi Agrawal, (2016), Cost Accounting Principles and Practice, 25th edition, Kalyani Publishers, New Delhi.
5. M.N Arora, (2013) Cost Accounting – Principles and Practice, 12th Edition, Vikas Publishing, New Delhi.
6. M.Y. Khan, P.K. Jain (2017), Management Accounting, 7th Edition, McGraw Hill Education, New Delhi.
7. Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari(2018), A Textbook of Accounting for Management, 4th Edition S Chand Publishing, New Delhi.

Semester – IV

21CSU404A **.Net Programming** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To Create windows forms using arrays and flow control statements.
- To Learn to use Basic windows controls using Visual Basic.Net
- To Learn to use the classes and namespaces in the .NET Framework class library.
- To Develop Web Applications using Microsoft ASP.NET programming.
- To Understand the concept of Multiple Document Interface and the architecture of .NET
- To use the databinding concept to connect the database and database controls

Course Outcomes (COs)

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

1. Develop Windows based applications using Visual Basic.Net
2. Learn various tools in .net applications
3. Implement ADO.Net concept in VB.Net and ASP.Net applications
4. Create server side web applications using ASP.NET
5. Understand the concept of data sources and data bound controls in VB.NET and ASP.NET
6. Design and develop Web based applications using ASP.NET

Unit I - Introduction

Getting Started with VB.NET: The Integrated Development Environment-IDE Components-CLR Functions - Environment Options. Visual Basic: The Language Variables-Constants-Arrays – Variables as Objects-Flow Control Statements. Working with forms: The appearance of Forms-Loading and Showing Forms-Designing Menus.

Unit II -Basic Windows Controls

Textbox Control- ListBox, CheckedListBox-Scrollbar and TrackBar Controls-More Windows Control-The common Dialog Controls-The Rich TextBox Control - Handling Strings, characters and Dates. The TreeView and ListView Controls: Examining the Advanced Controls-The TreeView Control-The ListView Control

Unit III -The Multiple Document Interface

Databases: Architecture and Basic Concepts-Building Database Application with ADO.NET-Programming with ADO.NET

Unit IV - ASP

Goal of ASP.NET –ASP.NET Web Server Control-Validation Server Controls-Themes and Skins -Content Page Holder

Unit V – Data Binding in ASP.Net

Data source Controls – Configuring data source control caching – storing connection information-Using Bound list controls with Data Source Controls – Other Data bound Controls-Data Management with ADO.Net.

Suggested Readings

1. Dino Esposito, Programming ASP.NET Core (Developer Reference),2018
2. William Penberthy, Beginning ASP.NET for Visual Studio 2015, 2016, John Wiley & Sons
3. Evangelos Petroutsos, Mastering Visual Basic.Net, BPB Publications, New Delhi.
4. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad and S.Srinivasa Sivakumar (2006), Professional ASP.net 2.0, Special Edition.
5. Ying Bai, Practical Database Programming with Visual Basic.Net (2012). 2nd Edition, John Wiley & Sons Publication, Canada
6. Matthew MacDonald, Beginning Asp.Net 4.5 in C# (2012), Data. New York.
7. Shirish Chavan. (2007), Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.

Websites

1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.w3schools.com/ngws/default.asp
4. www.vbtutot.com
5. https://freevideolectures.com/course/3002/dot-net-tutorial
6. https://www.nptelvideos.com/video.php?id=1760&c=21
7. http://172.16.25.76/course/view.php?id=370

Semester – IV

21CSU404B **Android Programming** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To design and develop useful Android applications with compelling user. interfaces .by using, extending, and creating your own layouts and Views and using Menus.

Course Outcomes (Cos)

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

1. Analyze the Architecture and features of Android with another Mobile Operating System.
2. Evaluate the standard of Kotlin language for developing Android Applications
3. Apply knowledge for creating user Interface and develop activity for Android App.
4. Evaluate the user interface architecture of Android for developing Android Apps
5. Understand the implementation of SQLite database operations with Android.
6. Design and implement Database Application and Content providers.

Unit I -Introduction

History of Android, Introduction to Android Operating Systems-Android Development Tools-Android Debug Bridge-Android Software Development Kit-Android Virtual Device- Android Architecture-Comparison between Android and Apple IOS - Android Application Components.

Unit II - OOPs Concepts of Kotlin Language

- Inheritance-Polymorphism-Interfaces- Abstract class-Threads- Overloading and Overriding-Exception Handling- Kotlin APIs for Android

Unit III -Creating a Hello World project

Role of XML in Android Development -Working with the AndroidManifest.xml -Features of Android Eclipse and Android Studio -Android Services - Android Service lifecycle – Android Foreground service -Android Background service

Unit IV -User Interface Architecture of Android

Application context- intents- Activity life cycle- Fragment Life Cycle. **User Interface Design:** Layout Manager- Form widgets- Text Fields- Layouts- Button control- toggle buttons- Spinners (Combo boxes)-Images- Menus-Dialog

Unit V -Introduction to SQLite database

Connecting SQLite with Android-SQLite Data Types-Cursors and content values-SQLite Open Helper-Adding- Updating and Deleting Content using SQLite Database

Suggested readings

1. Peter Spath (2019). Learn Kotlin for Android Development, APress Publications
2. James C.Sheusi,(2013). Android application development for Java programmers, Cengage Learning.

Websites

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://developer.android.com/guide/components/activities.html
5. http://developer.android.com/guide/components/fundamentals.html
6. http://developer.android.com/guide/components/intents-filters.html.
7. http://developer.android.com/training/multiscreen/screensizes.html
8. http://developer.android.com/guide/topics/ui/controls.html
9. http://developer.android.com/guide/topics/ui/declaring-layout.html
10. http://developer.android.com/training/basics/data-storage/databases.html
11. https://nptel.ac.in/courses/106106156/
12. http://172.16.13.33/course/view.php?id=606

Semester – IV

21CSU411 Operating Systems - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To implement the scheduling and process management algorithms.

Course Outcomes (COs)

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

1. Perform the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU
3. Evaluate the requirement for process synchronization and coordination handled by operating system
4. Describe and analyze the memory management and its allocation policies.
5. Identify use and evaluate the storage management policies with respect to different storage management technologies.
6. Identify the need to create the special purpose operating system.

List of Programs

1. Write a program (using fork() and/or exec() commands) where parent and child execute:
   a) same program, same code.
   b) same program, different code.
   c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.

11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using thread library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Suggested Readings

1. Silberschatz, A ., Galvin, P.B. , &Gagne,G.(2018). Operating Systems Concepts, 10th ed..New Delhi: John Wiley Publications.
2. Stallings, W.(2013). Operating Systems, Internals & Design Principles (7th ed.). New Delhi: Prentice Hall of India.
3. Jose M Garrido , Richard Schlesinger Kenneth Hoganson (2013). Principles of Modern Operating Systems,2nd edition,Library of Congress Cataloging-in-Publication Data.

Web Sites

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

Semester – IV

21CSU412 Software Engineering and Testing - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- To know basics of testing and understanding concept of Testing Tools.
- To learn the criteria and design for test cases for real-time applications.
-

Course Outcomes (COs)

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

1. Work effectively as leader/member of a development team to deliver quality software artifacts.
2. Implement a given software design using sound development practices.
3. Verify, validate, assess and assure the quality of software artifacts.
4. Design test cases suitable for a software development for different domains.
5. Identify suitable tests to be carried out.
6. Formulate the use-cases and test cases for real time applications

List of Programs

S. No	Practical Title
1.	• Problem Statement • Process Model
2.	Requirement Analysis: • Creating a DataFlow • Data Dictionary, UseCases
3.	Project Management: • Computing FP • Effort • Schedule, Risk Table, Timelinechart
4.	Design Engineering: • Architectural Design • Data Design, Component LevelDesign
5.	Testing: • Basis Path Testing

Sample Projects:[ANY 3]

1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers.

2. Patient Appointment and Prescription ManagementSystem.
3. Organized Retail Shopping Management Software.
4. Online Hotel Reservation Service System.
5. Examination and Result computation system
6. Automatic Internal Assessment System

Using Testing Tool: (Selenium) [ANY 5]

1. Using Selenium IDE, write a test suite containing minimum 4 test cases.
2. Conduct a test suite for any two websites.
3. Write and test a program to login a specific webpage
4. Write Selenium Web driver Script using java
5. Create Locators in Selenium using IDE
6. Find Element and Find Elements in Web using Selenium WebDriver
7. Program to Select Checkbox and Radio Button in Selenium WebDriver

Websites

1. www.testinggeek.com
2. www.softwaretestinghelp.com
3. www.softwaretestinginstitute.com
4. https://www.javatpoint.com/selenium-tutorial
5. https://nptel.ac.in/courses/106105087/

Semester – IV

21CSU413 Business Accounting - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

Enable the student

- To make the students learn the basic concepts, conventions, nature of accounting
- To know about the accounting process and preparation of final accounts of a sole trader.
- To understand the cost concepts,
- To understand types of costing and preparation of cost sheet.
- To understand the concepts of management accounting
- To compute financial statement analysis

COURSE OUTCOMES:

1. Comprehend the accounting concepts.
2. Principles and to comply the accounting standards.
3. Prepare the final accounts of a sole trader.
4. Know the cost concepts, types of costing and preparation of cost sheet.
5. Understand the concepts of management accounting
6. Compute financial statement analysis

List of exercises:

1. Create a company in Tally by your name.
2. Create a Company and Ledgers in Tally.
3. Create a Accounting voucher with example in tally.
4. Create Debit/Credit Notes, Memorandum and Post-Dated Vouchers in Tally
5. Create Stock Group, Stock Items and Unit of Measurement in Tally.
6. Prepare Balance Sheet, Profit/Loss Account and balance sheet
7. Balance sheet preparation
8. Preparation of cost sheet
9. Preparation of financial statement analysis.

SUGGESTED READINGS:

1. Shukla,M.C. Grewal T.S. Gupta. S.C. (2016) , Advanced Accounts. Vol.-I., 19th Edition, S. Chand & Co., New Delhi.
2. Dr S N Maheshwari & Dr Suneel K Maheshwari (2018), *Problems and Solutions in Advanced Accountancy* . 6th edition, Vikas Publishing House, New Delhi
3. S.P. Jain and K.L.Narang (2016) Advanced Accountancy Principles of Accounting, Kalyani Publishers, Ludhiana
4. SP Jain and KL Narang, Simmi Agrawal, (2016), Cost Accounting Principles and Practice, 25th edition, Kalyani Publishers, New Delhi.
5. M.N Arora, (2013) Cost Accounting – Principles and Practice, 12th Edition, Vikas Publishing, New Delhi.
6. M.Y. Khan, P.K. Jain (2017), Management Accounting, 7th Edition, McGraw Hill Education, New Delhi.
7. Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari(2018), A Textbook of Accounting for Management, 4th Edition S Chand Publishing, New Delhi.

Semester – IV

21CSU414A .Net Programming - Practical 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- Create windows forms using arrays and flow control statements.
- Learn to use Basic windows controls using Visual Basic.Net
- Learn to use the classes and namespaces in the .NET Framework class library.
- Develop Web Applications using Microsoft ASP.NET programming.
- Understand the concept of Multiple Document Interface and the architecture of .NET

Course Outcomes (COs)

1. Upon completion of this course the students will be able to:
2. Develop Windows based applications using Visual Basic.Net
3. Learn various tools in .net applications
4. Implement ADO.Net concept in VB.Net and ASP.Net applications
5. Create server-side web applications using ASP.NET
6. Understand the concept of data sources and data bound controls in VB.NET and ASP.NET

List of Programs

VB.Net

1. Write a Program to perform various string manipulation functions.
2. Using windows application form, create a form, place controls and manipulate data.
3. Write a program to create inventory control using class library.
4. Write a program to create Web Services Using Vb.Net.
5. Write a program to create a screen saver using controls
6. Create an ActiveX program with simple example.
7. Using windows Application: Design Employee Details, use Sql Server as back end and also use checked list box.

ASP.Net

1. Write a program to create an on-line quiz using content page holder.
2. Write a program to retrieve Cookies information.
3. Write a program to count web page hits.
4. Write program to retrieve environment variables browser capability information.
5. Write a program for database connectivity to retrieve student information

Suggested Readings

1. Evangelos Petroutsos, Mastering Visual Basic.Net, BPB Publications, New Delhi.
2. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad and S.Srinivasa Sivakumar (2006), Professional ASP.net 2.0, Special Edition.
3. Ying Bai, Practical Database Programming with Visual Basic.Net (2012). 2nd Edition, John Wiley & Sons Publication, Canada
4. Matthew MacDonald, Beginning Asp.Net 4.5 in C# (2012), Data. New York.
5. Shirish Chavan. (2007), Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.

Websites

1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.w3schools.com/ngws/default.asp
4. www.vbtutot.com
5. https://freevideolectures.com/course/3002/dot-net-tutorial
6. https://www.nptelvideos.com/video.php?id=1760&c=21

Semester – IV

21CSU414B Android Programming - Practical 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To design and develop useful Android applications with compelling user. interfaces .by using, extending, and creating your own layouts and Views and using Menus.

Course Outcomes (Cos)

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

1. Analyze the Architecture and features of Android with another Mobile Operating System.
2. Evaluate the standard of Kotlin language for developing Android Applications
3. Apply knowledge for creating user Interface and develop activity for Android App.
4. Evaluate the user interface architecture of Android for developing Android Apps
5. Understand the implementation of SQLite database operations with Android.
6. Design and implement Database Application and Content providers.

List of Programs

1. Create an Android Application for implementing Button control.
2. Create an android program for implementing progress bar control.
3. Create an Android application for creating login page for checking Loginid and Password
4. Create an Android application for implementing Spinner control in Android Application
5. Create an Android application for implementing context menu.
6. Create an Android Application with list of any three courses in your college and on selecting a particular course HoD of that course should appear at the bottom of the screen.
7. Create an Android application with three option buttons with three color names and When the particular color is selected, the background color of the App should change.
8. Create an Android Application for drawing any image on screen
9. Create an Android application for implementing date picker control.
10. Create an Android application for creating sub menu.

Suggested readings

1. John Horton, Android Programming for Beginners, 2015, Packt Publishing Ltd
2. John Horton, Android Programming with Kotlin for Beginners, 2019, Packt Publishing Ltd
3. James C.Sheusi,(2013). Android application development for Java for Java programmers, Cengage Learning.

Websites

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html

4. http://developer.android.com/guide/components/activities.html
5. http://developer.android.com/guide/components/fundamentals.html
6. http://developer.android.com/guide/components/intents-filters.html.
7. http://developer.android.com/training/multiscreen/screensizes.html
8. http://developer.android.com/guide/topics/ui/controls.html
9. http://developer.android.com/guide/topics/ui/declaring-layout.html
10. http://developer.android.com/training/basics/data-storage/databases.html

Semester – V

21CSU501 Data Communication and Networks 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To read the fundamentals and basics concepts of Physical layer with real time examples
- To study data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer and Application layer.

Course Outcomes (COs)

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

1. Understand the functions of each layer in OSI and TCP/IP model.
2. Explain the multiplexing, switching concept and types of transmission media with real time examples.
3. Understand the error detection and can implement the data link layer protocols
4. Learn different medium access method to avoid collision and to learn about routing table.
5. Learn basic functionalities of transport layer and application layer.
6. Understand the error correction methods and can implement the data link layer protocols

Unit I -Introduction to Data Communication

An Overview – Data Communication – Network – The Internet - Protocols and Standards. Network Models: Layered Task - The OSI Model and Layers – TCP/IP Protocol Suite – Addressing. **Physical Layer:** Analog and Digital Signals – Periodic and Non-Periodic Signals - Transmission Impairments - Performance.

Unit II -(cont..)

Analog to Digital conversion - digital to analog conversion – Transmission Modes;; multiplexing techniques- Frequency Division Multiplexing –Wavelength Division Multiplexing – Time division Multiplexing. Transmission media: Guided Media – Unguided Media. **Switching:** Circuit-switched Networks – Datagram Network – Virtual-Circuit Networks.

Unit III -Data Link Layer

Error detection and error correction - data-link control- framing- flow and error control – protocols –Noisy channels: Simplest Protocol – Stop–and–Wait Protocol; and Noiseless Channels: Stop–and–Wait Protocol ARQ – Go-Back-N Automatic repeat request – Selective Repeat Automatic Repeat Request – Piggybacking.

Unit IV -Multiple Access Protocol

Random Access : Aloha – CSMA – CSMA/CD – CSMA/CA – Controlled Access: Reservation – Polling – Token Passing. **Networks Layer**: IPv6 Address -Delivery-Forwarding- **Unicast routing protocols:** Intra- and Inter domain Routing -Distance Vector Routing-Link state Routing- Path Vector Routing – Multicast Routing.

Unit V -Transport Layer

Process-to-Process Delivery: Connectionless versus Connection-oriented Service – Reliable versus unreliable – User datagram protocol –Transmission control Protocol. Congestion control and Quality of service: Data Traffic – Congestion Control – Techniques to improve QoS.. **Application layer:** Domain Name Space – E-Mail- FTP- WWW- HTTP.

Suggested Readings

1. Forouzan,B. A. (2017). Data Communications and Networking (5th ed.).New Delhi: THM.
2. Tanenbaum, A. S. (2012). Computer Networks **(**5th ed.).New Delhi: PHI.
3. Wayne Tomasi (2007) Introduction to Data Communications and Networking (1st ed). Pearson
4. Alberto Leon-Garcia, Indra Widjaja (2017). Communication Network (2nd ed). Mc Graw Hill education.
5. Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika (2010). A Level Data Communication & Network Technologies. BPB publication.

Web Sites

1. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
2. www.yale.edu/pclt/COMM/TCPIP.HTM
3. www.w3schools.com/tcpip/default.asp
4. http://www.engppt.com/2009/12/networking-fourozan-ppt-slides.html
5. http://citengg.blogspot.com/p/behrouz-forouzancomputer-networks4th.html
6. http://www.crectirupati.com/sites/default/files/lecture_notes/DCN%20NOTES.pdf
7. https://nptel.ac.in/courses/106105183/
8. http://172.16.25.76/course/view.php?id=1831

Semester – V

21CSU502A PHP Programming 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To write basic PHP syntax using various operators.
- To write PHP scripts to handle HTML forms.
- To analyze different tasks using PHP functions.
- To understand the regular expressions in PHP.
- To learn array data structure using PHP scripts.
- To design and develop website using PHP

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Write PHP scripts using operators to perform various functions
2. Design PHP scripts to handle HTML forms.
3. Implement different types of PHP functions.
4. Write regular expressions including modifiers, operators, and metacharacters.
5. Create PHP scripts using array.
6. Design and develop website using PHP

Unit I -Introduction to PHP

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP -Basic Syntax, PHP variables and constants -Types of data in PHP, Expressions, scopes of a variable (local, global)-PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwise, ternary and MOD operator-PHP operator Precedence and associativity

Unit II -Handling HTML form with PHP

Capturing Form Data-GET and POST form methods-Dealing with multi value fields Redirecting a form after submission -**PHP conditional events and Loops:** PHP IF Else conditional statements (Nested IF and Else) -Switch case, while, For and Do While Loop -Goto, Break, Continue and exit

Unit III -PHP Functions

Function, Need of Function, declaration and calling of a function -PHP Function with arguments, Default Arguments in Function -Function argument with call by value, call by reference -Scope of Function Global and Local

Unit IV -String Manipulation and Regular Expression

Creating and accessing String, Searching & Replacing String -Formatting, joining and splitting String, String Related Library functions-Use and advantage of regular expression over inbuilt function -Use of preg_match(), preg_replace(), preg_split()-functions in regular expression

Unit V -Array

Anatomy of an Array, Creating index based and Associative array, Accessing array-Looping with Index based array, with associative array using each() and foreach()-Some useful Library function

Suggested Readings

1. David Sklar, Adam Trachtenberg, (2014). PHP Cookbook: Solutions & Examples for PHP.
2. Robin Nixon,(2014). Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.
3. Luke Welling, Laura Thompson,(2008). PHP and MySQL Web Development, (4th ed.), Addition Paperback, Addison-Wesley Professsional.
4. Timothy Boronczyk, Martin E. Psinas, (2008). PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.
5. Steven Holzner, (2007). PHP: The Complete Reference Paperback, McGraw Hill Education (India), 2007.

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1. www.php.net/
2. en.wikipedia.org/wiki/PHP
3. www.w3schools.com/PHP/default.asp
4. http://www.nptelvideos.com/php/php_video_tutorials.php
5. http://172.16.25.76/course/view.php?id=1839

Semester – V

21CSU502B R Programming **4H – 4C**

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:**Internal :**40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives :

Upon successful completion of this course, students will be able to:

- To acquire the computing tasks such as using conditional processing statements, loops, and writing one's own functions.
- To perform advanced graphing of data and statistical modeling of data.
- To use statistical distribution functions in R
- To read Structured Data into R from various sources
- To understand split-apply-combine (group-wise operations) in R
- To perform basic statistical modeling of data using R

Course Outcome:

1. Learn how to install and configure software necessary for a statistical programming environment.
2. Discuss generic programming language concepts as they are implemented in a high-level statistical language.
3. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code.
4. Import external data into R for data processing and statistical analysis
5. Learn the main R data structures – vector and data frame
6. Design and develop R applications for data analytics.

Unit I - History and Overview of R

The S Philosophy - Back to R -Basic Features of R - FreeSoftware -Design of the R System - Limitations of R- R Resources .Getting Started with R :Installation - Getting started with the R interface -.R Nuts and Bolts :Entering Input - Evaluation -R Objects - Numbers - Attributes - Creating Vectors - Mixing Objects - Explicit Coercion - Matrices -Lists -Factors - Missing Values - Data Frames - Names .

Unit II - Getting Data In and Out of R

Reading and Writing Data - Reading Data Files with read.table() - Reading in Larger Datasets with read.table - Calculating MemoryRequirements for R Objects . Using the readr Package .Using Textual and Binary Formats for Storing Data :Using dput() and dump() – Binary Formats - Interfaces to the Outside World : File Connections - Reading Lines of a Text File - Reading From a URL Connection - Subsetting R Objects :Subsetting a Vector - Subsetting a Matrix - Subsetting Lists - Subsetting Nested Elements of a List - Extracting Multiple Elements of a List - Partial Matching -Removing NA Values .

Unit III - Vectorized Operations

Vectorized Matrix Operations .Dates and Times :Dates in R - Times in R - Operations on Dates and Times .Managing Data Frames with the dplyr package :Data Frames - Data Reshaping - The dplyr Package - dplyr Grammar - Installing the dplyr package

- select() - filter() -arrange() - rename() - mutate() - group_by()-%>%.Control Structures :if-else - for Loops - Nested for loops - while Loops - repeat Loops - next, break .

Unit V –Functions

Functions in R - Your First Function - Argument Matching - Lazy Evaluation – The Argument - Arguments Coming After the Argument .Scoping Rules of R : A Diversion on Binding Values to Symbol - Scoping Rules - Lexical Scoping: Why Does It Matter? -Lexical vs. Dynamic Scoping -- Application: Optimization - Plotting the Likelihood. Coding Standards for R .Loop Functions : Looping on the Command Line - lapply() - sapply() - split() - Splitting a Data Frame - tapply - apply() - Col/Row Sums and Means -Other Ways to Apply - mapply()-Vectorizing a Function .

Unit V - Debugging

Something's Wrong! - Figuring Out What's Wrong - Debugging Tools in R . Using traceback() - Using debug() - Using recover().Profiling R Code: Using system.time() . Timing Longer Expressions - The R Profiler - Using summaryRprof().Simulation :Generating Random Numbers - Setting the random number seed -Simulating a Linear Model - Random Sampling .

Suggested Readings

1. Daniel Navarro,(2013). *Learning Statistics with R.* University of Adelaide Publications.
2. Garrett Grolemund and Hadley Wickham (2016). *R for Data Science*
3. Hadley Wickham, (2014).*Advanced R Programming*, (1st ed.)
4. JeffreyStanton,(2013). *Introduction to Data Science, with Introduction to R,* Version3 ,
5. Roger.D.Peng, (2015).*R Programming for Data Science*

Websites

1. https://www.r-project.org/
2. https://www.datamentor.io/r-programming/
3. https://www.datacamp.com/courses/free-introduction-to-r?utm_
4. https://www.coursera.org/learn/r-programming
5. https://172.16.25.76/Course/View.php?id = 2216
6. https://nptel.ac.in/courses/111104100/
7. https://nptel.ac.in/content/syllabus_pdf/111104100.pdf
8. https://www.edx.org/learn/r-programming

Semester – V

21CSU503A Compiler Design 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand syntax-directed translation and intermediate code generation
- To learn to implement run-time storage administration.
- To learn to implement code optimization and code generator.
- Learn how to optimize and effectively generate machine codes

Course Outcomes (COs)

1. Understand the different phases of compiler.
2. Apply different parsing algorithms to develop the parsers for a given grammar.
3. Understand syntax-directed translation and run-time environment.
4. Develop the run- time storage administration.
5. Understand to implement code optimization techniques and a simple code generator.
6. Learn about Code optimization

Unit I

Introduction to Compliers: Compliers and Translator – Need of Translator – The structure of a Complier – Lexical analysis – Syntax analysis – Intermediate code generation – optimization – code generation – Complier – writing tools. Finite automata and lexical Analysis: The role of the lexical analysis – A simple approach to the design of lexical analysers- Regular expressions to finite automata – Minimizing the number of states of a DFA.

Unit II

The Syntactic specification of programming languages: context free grammars – derivations and parse trees – capabilities of context free grammars. Basic parsing techniques: Parsers – shift – reduce parsing – operator – precedence parsing – top down parsing – predictive parsers.

Unit III

Syntax – directed translation: syntax – directed translation schemes – implementation of syntax – directed translators – intermediate code – postfix notation – parse trees and syntax trees – 3 address code – quadruples and triples – translation of assignment statements – Boolean expressions – statements that alter the flow of control. Symbol tables: the contents of a symbol table – data structures for symbol table – representing scope information.

Unit IV

Run time storage administration: Implementation of a simple stack allocation scheme – implementation of block-structured languages – storage allocation in block structured languages. Error deduction and recovery: errors – lexical phase errors – syntactic phase errors – semantic errors.

Unit V

Introduction of code optimization: The principle sources of optimization – loop optimization – the DAG representation of basic blocks – value numbers and algebraic laws – Global data flow analysis. Code generation: Object programs – problems in code generation – a machine model – a simple code generator – register allocation and assignment – code generation from DAG's – peepholes optimization.

Suggested Readings

1. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles,Techniques and Tools‖, Second Edition, Pearson Education, 2009.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, MorganKaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.
5. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures:
6. A Dependence based Approach, Morgan Kaufmann Publishers, 2002.

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1. http://www.vssut.ac.in/lecture_notes/lecture1422914957.pdfhttps://www.iith.ac.in/~ramakrishna/Compilers-Aug14/
2. https://swayam.gov.in/nd1_noc20_cs13/preview
3. https://nptel.ac.in/courses/106105190/
4. .http://172.16.25.76/course/view.php?id=1847

Semester – V

21CSU503B **Cloud Computing** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: **3** Hours

Course Objectives

- To Provide a good understanding of the concepts, standards in Cloud computing
- To make the student understand about the cloud service providers and their usage.
- To learn how to secure the data in cloud depending.
- To understand the various service level agreements.
- To understand the cloud using various case studies.

Course Outcomes (COs)

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

1. Portray the recent trends in the field of cloud computing.
2. know the architecture of the cloud and the usage of clouds.
3. secure their data from the security issues.
4. make the students to work based on the various service level agreements.
5. work with the traditional cloud and Microsoft azure, etc.
6. Providing exposures to some open source and commercial clouds.

Unit I - Overview of Computing Paradigm

Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. **Introduction to Cloud Computing:** Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

Unit II - Cloud Computing Architecture

Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

Unit III - Cloud Security

Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Unit IV - Service Management in Cloud Computing

Service Level Agreements, customer SLAs, Enterprise SLAs, and Organization SLAs, Billing & Accounting, Resource management billing, Resource hierarchy in cloud billing, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling, Deployment, security and scalability.

Unit V - Case Studies

Case study of Service model using Google App Engine, Case study of Service model using Microsoft Azure, worker role, web role, virtual machine role, Case study of Service model using Amazon EC2, Case study of Service model using Eucalyptus.

Suggested Readings

1. Barrie Sosinsky. (2019). Cloud Computing Bible. New Delhi: Wiley-India,
2. Thomas Erl,Zaigham Mahmood(2019).Cloud computing concepts,Technology and Architecture,Prentice Hall
3. Rajkumar Buyya., James Broberg., &Andrzej, M. Goscinski Wile.Cloud Computing: Principles and Paradigms.
4. Nikos Antonopoulos., &Lee Gillam.(2018). Cloud Computing: Principles, Systems and Applications. Springer.
5. Ronald, L. Krutz., &Russell Dean Vines. (2016). Cloud Security: A Comprehensive Guide to Secure Cloud Computing.New Delhi: Wiley-India.
6. Gautam Shroff. (2019).Enterprise Cloud Computing Technology Architecture Applications. Adobe Reader ebooks available from eBooks.com.
7. Toby Velte., Anthony Velte., & Robert Elsenpeter.(2018).Cloud Computing, A Practical Approach. McGraw Hills.
8. Dimitris, N. Chorafas.(2017).Cloud Computing Strategies. CRC Press.

Websites

1. wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx
5. https://nptel.ac.in/courses/106105167/
6. http://172.16.25.76/course/view.php?id=1785

Semester – V

21CSU504A **Machine Learning** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

- To define the types and theory of machine learning.
- To describe the classification models of machine learning
- To learn the techniques of distance-based models of machine learning
- To examine the various tree based and rule-based models of machine learning
- To demonstrate the concept of reinforcement learning for game playing
- To effectively use machine learning toolboxes to design and develop machine learning applications.

Course Outcomes (Cos)

Upon successful completion of the course the student will be able to:

1. Analyze theory of machine learning components and models
2. Characterize the algorithms of machine learning to learn linear and non-linear models
3. Implement data clustering algorithms for machine learning process
4. Construct machine learning algorithms to learn tree and rule-based models
5. Apply reinforcement machine learning techniques for robotics
6. Design and develop machine learning applications.

Unit I - Foundations Of Learning

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound –bias and variance – learning curve

Unit II - Linear Models

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – generalization and over fitting – regularization – validation

Unit III - Distance-Based Models

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k- d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta silhouttes – hierarchical clustering – k-d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

Unit IV - Tree and Rule Models

Decision trees – learning decision trees – ranking and probability estimation trees –Regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first -order rule learning

Unit V - Reinforcement Learning

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal - difference learning – active reinforcement learning – genetic algorithm for Reinforcement Learning- exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

Suggested Readings

1. Tom.M.Mitchell (2017), Machine Learning, Tata McGraw Hill Publications
2. Y. S. Abu - Mostafa, M. Magdon-Ismail, and H.-T. Lin. (2012).Learning from Data, AMLBook Publishers.
3. P. Flach. (2012). "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press.
4. K. P. Murphy. (2012). Machine Learning: A probabilistic perspective, MIT Press,
5. D. Barber. (2012). Bayesian Reasoning and Machine Learning, Cambridge University Press.

Web Sites

1. https://machinelearningmastery.com/linear-regression-for-machine-learning/
2. https://www.cambridge.org/core/books/machine-learning/distancebased-models/
3. https://dzone.com/articles/machine-learning-with-decision-trees
4. http://reinforcementlearning.ai-depot.com/
5. https://nptel.ac.in/courses/106106139/
6. https://swayam.gov.in/nd1_noc19_cs81/preview

Semester – V

21CSU504B **Computer Graphics** **3H – 3C**

Instruction Hours / week:L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

- This course presents an introduction to computer graphics designed to give the student an overview of fundamental principles.
- The course makes the student to understand about the video and raster scan displays and their storage
- Methods for modeling objects as polygonal meshes or smooth surfaces, and as rendering such as hidden-surface removal, shading, illumination, and shadows will be investigated.
- To make the student to understand the usage of input devices and its working
- The course objective relies on the student to understand the line algorithm and 2D, 3D Geometrical transformation.
- To design and develop graphics editing applications.

Course Outcomes (COs)

Upon completion of the course, students will be able to

1. Have a knowledge and understanding of the structure of an interactive computer graphics system, and the separation of system components.
2. Have a knowledge and understanding of geometrical transformations and 2D viewing.
3. Be able to create interactive graphics applications.
4. Have a knowledge and understanding of techniques for representing 3D geometrical objects.
5. Have a knowledge and understanding of the various clipping algorithms and visible surface detection algorithm.
6. Design and develop graphics editing applications.

Unit I - A Survey of Computer Graphics

Video Display Devices- Refresh cathode-Ray Tubes-Raster Scan Displays-Random Scan Displays-Color CRT Monitors-Direct –View Storage Tubes-Flat Panel Displays-Raster Scan Systems-Three Dimensional Viewing Devices-Random Scan Systems.

Unit II - Input Devices

Keyboards-Mouse –Track Ball and Space ball-Joysticks-Data Glove- digitizers-Image Scanners-Touch Panels-Light Pens-Voice Systems-**Hard Copy Devices**: Printers and Plotters

Unit III - Point and Lines- Line Drawing Algorithms

DDA Algorithm- Bresenhams Line Algorithm. **Circle Generating Algorithms**: Mid Point Circle Algorithm. Two Dimensional Geometric Transformations: **Basic Transformations**: Translation-Rotation-Scaling-**Composite Transformations**: Translations-Rotations- Scaling. General Pivot Point Rotation- General Fixed Point Scaling.

Unit IV - Two Dimensional Viewing

The Viewing Pipeline- Window to view port Transformation-**Clipping Operations**-Point Clipping -Line Clipping: Cohen Sutherland Line Clipping. Polygon Clipping: Sutherland – Hodgeman Polygon Clipping-Text Clipping.

Unit V Three – Dimensional Display Methods

Parallel Projection- three Dimensional Geometric Transformations: Translation-Rotations-Scaling. **Projections**: Parallel Projections-Perspective Projections. **Visible Surface Detection Methods**: Classification of Visible Surface Detection Algorithms-Back Face Detection- Depth Buffer Method- Area Sub division Method.

Suggested Readings

1. John F Hughes;Andries Van Dam;MorganMcGuire;David F Sklar;James D Foley;Steven K Feiner;Kurt Akeley,2018 ,Computer Graphics: Principles and Practice by Pearson
2. V. Scott Gordon, 2018,Computer Graphics Programming in OpenGL with Java (2e)Publisher: Mercury
3. OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 4.5 with SPIR-V 9th Edition, Kindle Edition byJohn Kessenich (Author), Graham Sellers (Author), Dave Shreiner (Author) 2016.
4. Interactive Computer Graphics: A Top-Down Approach with WebGL (7th Edition) 7th Edition by Edward Angel (Author), Dave Shreiner (Author),2014.
5. Donald Hearn and M. Pauline Baker. 2007. Computer Graphics-C Version, 2nd Edition, Pearson Education, New Delhi.

Websites

1. www.cgshelf.com
2. www.cgtutorials.com
3. www.allgraphicdesign.com
4. https://nptel.ac.in/courses/106/102/106102063/

Semester – V

21CSU511 Data Communication and Networks - Practical 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To design and implement error detection algorithm
- Understand the basic concepts of cyclic codes, and explain how cyclic redundancy check works.
- Understand the concept of Routing algorithm to find shortest path using Distance vector algorithm
- To learn data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To effectively simulate the protocols using programming languages.

Course Outcomes (COs)

At the end of the course, the student should be able to:

1. Build a program to implement error detection algorithm.
2. Develop a program to implement stop and wait protocol, go back N protocol and selective repeat sliding window protocol.
3. Simulate and build a program to implement routing protocol.
4. Understand the error detection and correction methods and can implement the data link layer protocols
5. Learn different medium access method to avoid collision and to learn about routing table.
6. Simulate the protocols using programming languages

List of Programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Suggested Readings

1. Forouzan,B. A. (2017). Data Communications and Networking (5th ed.).New Delhi: THM.
2. Tanenbaum, A. S. (2012). Computer Networks **(**5th ed.).New Delhi: PHI.
3. Wayne Tomasi (2007) Introduction to Data Communications and Networking (1st ed). Pearson
4. Alberto Leon-Garcia, Indra Widjaja (2017). Communication Network (2nd ed). Mc Graw Hill education.
5. Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika (2010). A Level Data Communication & Network Technologies. BPB publication.

Web Sites

1. https://forgetcode.com/c/1203-crc-generation-in-computer-networks
2. https://gist.github.com/ankurdinge/1202643

3. https://www.geeksforgeeks.org/
4. https://www.thelearningpoint.net/computer-science/c-program
5. www.w3schools.com/tcpip/default.asp
6. http://172.16.25.76/course/view.php?id=1835

Semester – V

21CSU512A PHP Programming - Practical 4H – 2C

Instruction Hours / week: L: T: 0 P: 4 Marks: Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To write basic PHP syntax using various operators.
- To write PHP scripts to handle HTML forms.
- To analyze different tasks using PHP functions.
- To understand the regular expressions in PHP.
- To learn array data structure using PHP scripts.
- To work with open source applications that deal with database and website development.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Write PHP scripts using operators to perform various functions
2. Design PHP scripts to handle HTML forms.
3. Implement different types of PHP functions.
4. Write regular expressions including modifiers, operators, and metacharacters.
5. Create PHP scripts using array.
6. Develop dynamic web pages.

List of Programs

1. Write a PHP program that will use the concept of form.
2. Write a PHP program to read the employee detail using Form Component.
3. Write a PHP program to demonstrate the use of Array.
4. Write a PHP program to prepare the student mark sheet using Switch statement
5. Write a PHP program to generate the Multiplication of Matrix.
6. Write the PHP programs to do Multiplication of two matrices.
7. Write a PHP program to display a digital clock which displays the current time of the server.
8. Develop web page with data validation.

Suggested Readings

1. David Sklar, Adam Trachtenberg, (2014). PHP Cookbook: Solutions & Examples for PHP.
2. Luke Welling, Laura Thompson,(2008). PHP and MySQL Web Development, (4th ed.), Addition Paperback, Addison-Wesley Professsional.
3. Robin Nixon,(2014). Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.
4. Steven Holzner, (2007). PHP: The Complete Reference Paperback, McGraw Hill Education (India), 2007.
5. Timothy Boronczyk, Martin E. Psinas, (2008). PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.

Semester – V

21CSU512B R Programming - Practical 4H – 2C

Instruction Hours / week: L: T: 0 P: 4 Marks: Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives :

Upon successful completion of this course, students will be able to:

- To acquire the computing tasks such as using conditional processing statements, loops, and writing one's own functions.
- To perform advanced graphing of data and statistical modeling of data.
- To use statistical distribution functions in R
- To read Structured Data into R from various sources
- To understand split-apply-combine (group-wise operations) in R
- To perform basic statistical modeling of data using R

Course Outcome:

1. Learn how to install and configure software necessary for a statistical programming environment.
2. Discuss generic programming language concepts as they are implemented in a high-level statistical language.
3. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code.
4. Import external data into R for data processing and statistical analysis
5. Learn the main R data structures – vector and data frame
6. Design and develop R applications for data analytics.

List of Experiments:

1. Write a program to demonstrate functions and operators
2. **Vectors:** Grouping values into vectors, then doing arithmetic and graphs with them
3. **Matrices:** Creating and graphing two-dimensional data sets
4. **Summary Statistics:** Calculating and plotting some basic statistics: mean, median, and standard deviation
5. **Factors:** Creating and plotting categorized data
6. **Data Frames:** Organizing values into data frames, loading frames from files and merging them
7. Write a program to design R as a calculator
8. Write a program to demonstrate Probability distributions
9. Write a program to demonstrate Importing and exporting data
10. Write a program to Establish a Regression

Suggested Readings

1. Daniel Navarro,(2013). *Learning Statistics with R*. University of Adelaide Publications.
2. Garrett Grolemund and Hadley Wickham (2016). *R for Data Science*
3. Hadley Wickham, (2014).*Advanced R Programming*, (1st ed.)
4. JeffreyStanton,(2013). *Introduction to Data Science, with Introduction to R*, Version3 ,
5. Roger.D.Peng, (2015).*R Programming for Data Science*

Websites :

1. https://www.r-project.org/
2. https://www.datamentor.io/r-programming/
3. https://www.datacamp.com/courses/free-introduction-to-r?utm_
4. https://www.coursera.org/learn/r-programming
5. https://172.16.25.76/Course/View.php?id = 2216
6. https://nptel.ac.in/courses/111104100/
7. https://nptel.ac.in/content/syllabus_pdf/111104100.pdf
8. https://www.edx.org/learn/r-programming

Semester – VI

21CSU513A **Compiler Design - Practical** **4H – 2C**

Instruction Hours / week: L: T: 0 P: 4 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand syntax-directed translation and intermediate code generation
- To learn to implement run-time storage administration.
- To learn to implement code optimization and code generator.
- Learn how to optimize and effectively generate machine codes

Course Outcomes (COs)

1. Understand the different phases of compiler.
2. Apply different parsing algorithms to develop the parsers for a given grammar.
3. Understand syntax-directed translation and run-time environment.
4. Develop the run- time storage administration.
5. Understand to implement code optimization techniques and a simple code generator.
6. Learn about Code optimization

LIST OF PROGRAMS:

1. Implementation of Symbol Table
2. Implementation of Lexical Analyzer using Lex Tool
   - **a)** The program replaces the substring abc by ABC from the given input string:
   - **b)** Well formedness of brackets
   - **c)** Finding vowels and consonant in a string
   - **d)** Finding the capital
   - **e)** It is used to display the Keywords and identifiers in the given program.
3. Construction Of Operator Precedence Parse Table
4. Generate YACC specification for a few syntactic categories.
   a)Implementation Of Calculator Using Yacc.
5. Generation of code for a given intermediate code.
6. Implementation of code optimization techniques

Suggested Readings

1. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.
5. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures:
6. A Dependence based Approach, Morgan Kaufmann Publishers, 2002.

Websites

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3. https://nptel.ac.in/courses/106105190/
4. .http://172.16.25.76/course/view.php?id=1847
5. http://www.vssut.ac.in/lecture_notes/lecture1422914957.pdfhttps://www.iith.ac.in/~ramakrishna/Compilers-Aug14/

Semester – V

21CSU513B **Cloud Computing - Practical** **4H – 2C**

Instruction Hours / week: L: T: 0 P: 4 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To Provide a good understanding of the concepts, standards and protocols in Cloud computing
- To make them understand to work on virtual machines on different platform.
- To enable them to work on different tools used in cloud.
- To make them understand the concept on sharing the data and their storage in cloud.
- To make them explore the different types of cloud my making them work in it.
- To familiarize various cloud computing platforms like Amazon, Google and Microsoft.

Course Outcomes (COs)

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

1. Portray the recent trends in the field of cloud computing
2. Provide exposures to some open source and commercial clouds.
3. Enable the students to work on different platforms and to access them.
4. Work on the virtual machines will know the usage of the clouds.
5. Secure the data and give the finest band width of their service to the customer.
6. Explore various cloud computing platforms like Amazon, Google and Microsoft.

List of Programs

1. Create virtual machines that access different programs on same platform.
2. Create virtual machines that access different programs on different platforms.
3. Working on tools used in cloud computing online-
    a) Storage
    b) Sharing of data
    c) Manage your calendar, to-do lists,
    d) A document editing tool
4. Exploring Google cloud
5. Exploring Microsoft cloud
6. Exploring Amazon cloud

Suggested Readings

1. Barrie Sosinsky. (2019). Cloud Computing Bible. New Delhi: Wiley-India,
2. Thomas Erl,Zaigham Mahmood(2019).Cloud computing concepts,Technology and Architecture,Prentice Hall
3. Rajkumar Buyya., James Broberg., &Andrzej, M. Goscinski Wile.Cloud Computing: Principles and Paradigms.
4. Nikos Antonopoulos., &Lee Gillam.(2018). Cloud Computing: Principles, Systems and Applications. Springer.
5. Ronald, L. Krutz., &Russell Dean Vines. (2016). Cloud Security: A Comprehensive Guide to Secure Cloud Computing.New Delhi: Wiley-India.
6. Gautam Shroff. (2019).Enterprise Cloud Computing Technology Architecture Applications. Adobe Reader ebooks available from eBooks.com.

7. Toby Velte., Anthony Velte., & Robert Elsenpeter.(2018).Cloud Computing, A Practical Approach. McGraw Hills.
8. Dimitris, N. Chorafas.(2017).Cloud Computing Strategies. CRC Press.

Websites

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2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx
5. https://nptel.ac.in/courses/106105167/
6. http://172.16.25.76/course/view.php?id=1785

Semester – V

21CSU514A **Machine Learning - Practical** **3H – 1C**

Instruction Hours / week: L: T: 0 P: 3 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To understand the various characteristics of Intelligent agents
- To learn about the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.
- To effectively use machine learning toolboxes to design and develop machine learning applications.

Course Outcomes (Cos)

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

1. Identify problems that are amenable to solution by AI methods.
2. Identify appropriate AI methods to solve a given problem.
3. Formalize a given problem in the language/framework of different AI methods.
4. Implement basic AI algorithms.
5. Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.
6. To effectively use machine learning toolboxes to design and develop machine learning applications.

List of Programs

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.
2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).
3. Create, initialize and display simple variables and simple strings and use simple formatting for variable.
4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.
5. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current Course Objectives.
6. Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.
7. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.
8. Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.
9. Generate different subplots from a given plot and color plot data.
10. Use conditional statements and different type of loops based on simple example/s.

11. Perform vectorized implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.
12. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.
13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
14. Implement a classification/ logistic regression problem. For example based on different features of students data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.
15. Use some function for regularization of dataset based on problem 14.
16. Use some function for neural networks, like Stochastic Gradient Descent or back propagation - algorithm to predict the value of a variable based on the dataset of problem

Suggested Readings

1. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer.

Semester – V

21CSU514B **Computer Graphics - Practical** **3H – 1C**

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:**Int :**40** Ext : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- This course presents an introduction to computer graphics designed to give the student an overview of fundamental principles.
- The course makes the student to understand about the video and raster scan displays and their storage
- Methods for modeling objects as polygonal meshes or smooth surfaces, and as rendering such as hidden-surface removal, shading, illumination, and shadows will be investigated.
- To make the student to understand the usage of input devices and its working
- The course objective relies on the student to understand the line algorithm and 2D, 3D Geometrical transformation.
- To design and develop graphics editing applications.

Course Outcomes (COs)

Upon completion of the course, students will be able to

1. Have a knowledge and understanding of the structure of an interactive computer graphics system, and the separation of system components.
2. Have a knowledge and understanding of geometrical transformations and 2D viewing.
3. Be able to create interactive graphics applications.
4. Have a knowledge and understanding of techniques for representing 3D geometrical objects.
5. Have a knowledge and understanding of the various clipping algorithms and visible surface detection algorithm.
6. Design and develop graphics editing applications.

List of Experiments:

1. Program to draw a line using DDA algorithm.
2. Program to draw a line using Bresenham‟s algorithm.
3. Program to draw a circle using Bresenham‟s algorithm.
4. Program to implement the Character generation algorithm.
5. Program to implement the Polygon clipping alogorithm.
6. Program to implement the Text clipping algorithm.
7. Program to implement the line Clipping algorithm.
8. Program to implement the 2D Translation, 2D Rotation and 2D scaling.
9. Program to implement the 3D Translation, 3D Rotation and 3D scaling.
10. Program to implement the Shearing and Reflection of an object.

REFERENCES

1. John F Hughes;Andries Van Dam;MorganMcGuire;David F Sklar;James D Foley;Steven K Feiner;Kurt Akeley,2018 ,Computer Graphics: Principles and Practice by Pearson
2. V. Scott Gordon, 2018,Computer Graphics Programming in OpenGL with Java (2e)Publisher: Mercury

3. OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 4.5 with SPIR-V 9th Edition, Kindle Edition byJohn Kessenich (Author), Graham Sellers (Author), Dave Shreiner (Author) 2016.
4. Interactive Computer Graphics: A Top-Down Approach with WebGL (7th Edition) 7th Edition by Edward Angel (Author), Dave Shreiner (Author),2014.

WEB SITES

1. www.cgshelf.com
2. www.cg**tutorials**.com
3. www.allgraphicdesign.com

NPTEL WEBSITE

1.https://nptel.ac.in/courses/106/102/106102063/
2.https://nptel.ac.in/courses/106106090/
3.http://www.nptelvideos.in/2012/11/computer-graphics.html

Semester – VI

21CSU601 Data Mining 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To introduce students to the basic concepts and techniques of Data Mining.
- To understand data mining fundamentals and characterize the kinds of patterns that can be discovered by association rule mining
- To compare and evaluate different data mining techniques like classification, prediction, etc.
- To cluster the high dimensional data for better organization of the data
- To describe complex data types with respect to spatial and web mining
- To design data warehouse with dimensional modelling and apply OLAP operations.

Course Outcomes (COs)

Upon completion of this course students will be able to:

1. Understand the basic concepts and techniques of Data Mining
2. Extract knowledge using data mining techniques and Implement Preprocess the data for mining applications and apply the association rules for mining the data
3. Design and deploy appropriate classification techniques
4. Understand the concept of clustering and its real time applications
5. Explore recent trends in data mining such as web mining, spatial-temporal mining
6. Analyze the basic concepts of data warehouse and OLAP operations

UNIT I- Introduction

Data mining application - data mining techniques - the future of data mining - data mining software - Association rules mining: basics- task and a naïve algorithm- Apriori algorithm - improve the efficient of the Apriori algorithm - mining frequent pattern without candidate generation (FP-growth) - performance evaluation of algorithms.

UNIT II - Classification

Introduction - decision tree - over fitting and pruning - DT rules- Naive bayes method- estimation predictive accuracy of classification methods - other evaluation criteria for classification method - classification software.

UNIT III - Cluster analysis

cluster analysis - types of data - computing distances-types of cluster analysis methods - partitioned methods - hierarchical methods - density based methods - dealing with large databases - quality and validity of cluster analysis methods - cluster analysis software.

UNIT IV- Web data mining

Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining - web mining software - Search engines: Search engines functionality- search engines architecture - ranking of web pages.

UNIT V -Data warehousing

Introduction - Operational data sources- data warehousing - Data warehousing design - Guidelines for data warehousing implementation - Data warehousing metadata - Online analytical processing (OLAP): Introduction - OLAP characteristics of OLAP system - Multidimensional view and data cube - Data cube implementation - Data cube operations OLAP implementation guidelines.

Suggested Readings

1. Steinbach Tan, Kumar, “Introduction to Data Mining”, First edition, Pearson Education; 2016.
2. 2.Mohammed J. Zaki, Wagner Meira, Jr. “Data Mining and Analysis Fundamental Concepts and Algorithms”, Cambridge University Press, May 2014
3. Han, Kamber& Pei, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publisher, Third Edition, 2013
4. G.K. Gupta, "Introduction to Data mining with case studies", 2nd Edition, PHI Private limited, New Delhi, 2011.
5. Arun K Pujari, "Data Mining Techniques", 10th impression, University Press, 2008.

Websites

1. www.geeksforgeeks.org
2. www.tutorialride.com
3. www.javatpoint.com
4. https://nptel.ac.in/courses/106105174/
5. http://172.16.25.76/course/view.php?id=100

Semester – VI

21CSU602A Information Security and Cyber Laws **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:**Internal :**40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
- To explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
- To understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications
- To understand the various Cyber laws and its sections with case studies.

Course Outcomes(COs)

A student who successfully completes this course should at a minimum be able to:

1. Explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
2. State the basic concepts in information security
3. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
4. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
5. Understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications
6. Understand the various Cyber laws and its sections with case studies.

Unit I - Course Introduction

Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security.
Digital Crime: Overview of digital crime, criminology of computer crime.

Unit II - Information Gathering Techniques

Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking

Unit III - Risk Analysis And Threat

Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, internal vs external threat, security assurance, passwords, authentication, and access control, computer forensics and incident response

Unit IV- Introduction To Cryptography And Applications

Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Caeser Cipher, Rail-Fence Cipher, Public key cryptography (Definitions only), Private key cryptography (Definition and Example)
Safety Tools and Issues : Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

Unit V- Cyber Laws
CYBER LAWSto be covered as per IT 2008:
• Chapter 1: Definitions 88
• Chapter 2: Digital Signature And Electronic Signature
• [Section 43] Penalty and Compensation for damage to computer, computer system, etc.
• [Section 65] Tampering with Computer Source Documents
• [Section 66 A] Punishment for sending offensive messages through communication service, etc.
• [Section 66 B] Punishments for dishonestly receiving stolen computer resource or communication device
• [Section 66C] Punishment for identity theft
• [Section 66D] Punishment for cheating by personation by using computer resource
• [Section 66E] Punishment for violation of privacy
• [Section 66F] Punishment for cyber terrorism
• [Section 67] Punishment for publishing or transmitting obscene material in electronic form
• [Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form[Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form
• [Section 72] Breach of confidentiality and privacy

SUGGESTED READINGS

1. M. Merkow, J. Breithaupt. 2005. Information Security Principles and Practices. Pearson Education. 2005.
2. G.R.F. Snyder, T. Pardoe. 2010. Network Security. Cengage Learning.
3. A. Basta, W.Halton. 2008. Computer Security: Concepts, Issues and Implementation. Cengage Learning India.
4. Nina Godbole & SUNIT Belapure.(2013) CYBER SECURITY. Wiley India Pvt.Ltd.New Delhi.

WEB SITES

1. http://www.csc.ncsu.edu/faculty/ning
2. csrc.nist.gov/publications/nistpubs/800-12/handbook.pdf
3. www2.warwick.ac.uk/fac/sci/dcs/teaching/modules/cs134/

Semester – V

21CSU602B **Digital Image Processing** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To evaluate the techniques for image enhancement and image restoration.
- To interpret image segmentation and representation techniques.

Course Outcomes (COs)

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

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

Unit I - Introduction

Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, smoothing filters, sharpening filters, gradient and Laplacian.

Unit II – Transforms and Properties

Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Unit III – Image Restoration

Image Restoration, Basic Framework, Interactive Restoration, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Image Compression-Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Run length coding.

Unit IV – Image Compression

FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation

Wavelet based Image Compression: Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking

Unit V - Morphological Image Processing

Basics, SE, Erosion, Dilation, Opening, Closing, Boundary Detection, skeletons, pruning. Image Segmentation: Boundary detection-based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding.

Suggested Readings

1. Rafael C. Gonzalez,Richard E. Woods, Digital Image Processing (4th Edition), 2017, Pearson Education
2. Mark Nixon, Feature Extraction and Image Processing for Computer Vision, Third Edition, 2012, Elsevier
3. Wilhelm Burger,Mark J. Burge, Principles of Digital Image Processing: Fundamental Techniques (Undergraduate Topics in Computer Science), 2011, Springer
4. Maria Petrou,Costas Petrou, Image Processing: The Fundamentals, 2010, Wiley Publications
5. Wilhelm Burger,Mark J. Burge, Principles of Digital Image Processing: Core Algorithms (Undergraduate Topics in Computer Science), 2009, Springer
6. Rafael C. Gonzalez,Richard E. Woods,Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd ed.,2009, Gatesmark Publishing
7. Gonzalez, R. C., & Woods, R. E. (2008). Digital Image Processing (3rd ed.). New Delhi: Pearson Education.
8. Rafael, C. Gonzalez., Richard, E. Woods., & Steven Eddins. (2004). Digital Image Processing using MATLAB. New Delhi: Pearson Education.

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1. http://www.imageprocessingplace.com/DIP-3E/dip3e_classroom_presentations_downloads.htm
2. https://www.tutorialspoint.com/dip/index.htm
3. https://www.javatpoint.com/digital-image-processing-tutorial
4. https://nptel.ac.in/courses/117/105/117105135/
5. http://172.16.25.76/course/view.php?id=101

Semester – VI

21CSU603A **Internet Technologies** **3H – 3C**

Instruction Hours / week:L:3 T: 0 P: 0 **Marks:** Internal :**40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To get familiar with basics of the Internet Programming.
- To acquire knowledge and skills for creation of web site considering both client and server side programming
- To gain ability to develop responsive web applications using JavaScript
- To develop advanced Java applications using JDBC
- To learn and create JSP applications
- To develop the component based applications using Java Beans

Course Outcomes(COs)

1. Familiarize with the basics of the Internet Programming.
2. Acquires knowledge and skills for creation of web site considering both client and server side programming
3. Ability to develop responsive web applications using JavaScript
4. Develop advanced Java applications using JDBC
5. Understand and create JSP applications
6. Develop the component based applications using Java Beans

Unit I - JAVA

Use of Objects, Array and ArrayList class

Unit II - JAVASCRIPT

Data types, operators, functions, control structures, events and event handling.

Unit III - JDBC

JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

Unit IV - JSP

Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

Unit V: Java Beans

Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB

SUGGESTED READINGS

1. Ivan Bayross. 2009. Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications.
2. Cay Horstmann. BIG Java. Wiley Publication. 2009. 3rd Edition.

3. Herbert Schildt. 2009. Java 7. The Complete Reference.8th Edition.
4. Jim Keogh. 2002. The Complete Reference. J2EE. TMH.
5. O'Reilly. 2003. Java Server Pages. Hans Bergsten. Third Edition.

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1. www.ntu.edu.sg/home/ehchua/programming/java/JSPByExample.html
2. https://docs.oracle.com/cd/E15523_01/web.1111/e13712/reference.htm
3. https://www.tutorialspoint.com/jsp/jsp_quick_guide.htm

Semester – VI

21CSU603B E-Commerce Technologies 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To design components, systems and/or processes to meet required specifications for a web presence.
- To learn the development of electronic business from its origins in electronic data interchange to its current growing importance.
- To secure & work as an effective member or leader of diverse teams within a multi-level, multi-disciplinary and multi-cultural setting for the Group Website Research Project.
- To be aware of global perspectives of M-Commerce(needs, rules/regulations, and specifications)
- To demonstrate effective and integrative team-work through mobile technology.
- To design and develop effective and efficient e-commerce applications

Course Outcomes (COs)

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

1. Discuss electronic commerce and the stakeholders and their capabilities and limitations in the strategic convergence of technology and business.
2. Gain the global nature and issues of electronic commerce as well as understand the rapid technological changes taking place and electronic payment options.
3. Identify advantages and disadvantages of E-security technology.
4. Demonstrate awareness of ethical, social and legal aspects of M-commerce
5. Analyse features of existing M-commerce businesses, and propose future directions or innovations for specific businesses
6. Explain the added value, risks and barriers in the adoption of electronic fund transfer

Unit I: An Introduction to Electronic commerce

What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce,Electronic Commerce Applications, Electronic Commerce and Electronic Business (C2C) (C2G, G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C).

Unit II: Electronic data

Electronic data exchange introduction, concepts of EDI and Limitation, Apllication of EDI, Disadvantgaes of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment system, Payment types, Value exchange system, credit card system electronic fund transfer, Paperless bill, modern payment cash, Electronic cash, Banner, Shopping Bots.

Unit III: E-security

Security issues, security threats, encryption –public key encryption, private key encryption security procedure- access control, and firewall and its types, password, Digital signature, digital

certificate.Domain Names and Internet - Organization (.edu, .com, .mil, .gov, .net etc), building own website, cost, time, reach, registering a domain name, web promotion.

Unit IV: Mobile Commerce

Introduction-Infrastructure of M-Commerce-Types of mobile commerce service-Wireless Application Protocol (WAP), Generations of Mobile Wireless Technology, Components of Mobile Commerce, Networking Standards for Mobiles. -Benefits and limitations of Mobile Commerce, Non-internet applications in M-Commerce-Wireless/Wired commerce comparisons.

Unit V: Mobile Commerce -Theory and Applications

The Ecology of Mobile Commerce-Mobile business services-Mobile portal-Factors influencing the Adoption of Mobile Gaming services-Mobile data technologies and small business adoption and diffusion –Location based services:Criteria for adoption and solution deployment– The role of mobile advertising in building a brand M-commerce business models.

Suggested Readings

1. David Whiteley, “E - Commerce: Strategy, Technologies and Applications”, McGraw Hill Education (July 2017).
2. Bharat Bhasker , “ Electronic Commerce: Framework, Technologies and Applications”,
3. McGraw Hill Education; Fourth edition (July 2017).
4. Gaurav Gupta and Sarika Gupta ,” E-Commerce”, Khanna Book Publishing Company;
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6. M. Suman & N. Divakara Reddy, “Advanced E-commerce and mobile commerce”, Himalaya Publishing House (September 2015).
7. Paul May, “Mobile Commerce”, Cambridge University Press (2017)

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2. https://feinternational.com/blog/what-is-e-commerce-an-introduction-to-the-industry/
3. https://searchcio.techtarget.com/definition/e-commerce
4. https://www.toppr.com/guides/business-environment/emerging-trends-in-business/electronic-commerce/
5. https://searchmobilecomputing.techtarget.com/definition/m-commerce
6. https://www.toppr.com/guides/business-environment/emerging-trends-in-business/m-commerce/
7. https://bbamantra.com/m-commerce/
8. https://nptel.ac.in/content/storage2/courses/106108103/pdf/PPTs/mod13.pdf
9. http://172.16.25.76/course/view.php?id=1846

Semester– VI

21CSU611 Data Mining - Practical 4H – 2C

Instruction Hours / week: L: T: 0 P: 4 Marks: Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To Understand Data Mining fundamentals and Characterize the kinds of patterns that can be discovered by association rule mining
- To Compare and evaluate different data mining techniques like classification, prediction,
- To Cluster the high dimensional data for better organization of the data
- To describe complex data types with respect to spatial and web mining
- To Design data warehouse with dimensional modelling and apply OLAP operations.
- To use Weka tool to implement various data mining algorithms.

Course Outcomes (COs)

Upon completion of this course students will be able to:

1. Extract knowledge using data mining techniques and Implement Preprocess the data for mining applications and apply the association rules for mining the data
2. Design and deploy appropriate classification techniques
3. Understand the concept of clustering and its real time applications
4. Explore recent trends in data mining such as web mining, spatial-temporal mining
5. Able to know the basic concepts of data warehouse and OLAP operations
6. Use Weka tool to implement various data mining algorithms

List of Programs

1. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). for test options, first choose “Use training set”, then choose “Percentage split” using default 66% percentage split. Report model percent error rate.
2. Use iris dataset preprocess and classify it with j4.8 and Naive Bayes classifier. Examine the tree in the classifier output panel.
3. Using the dataset ReutersCorn – Train and ReutersGrain – Train. Classify articles using binary attributes and word count attributes.
4. Apply any two association rule based algorithm for the supermarket analysis.
5. Using weka experimenter perform comparison analysis of j4.8, oneR and ID3 forvote dataset.
6. Using weka experimenter perform comparison analysis of Naive Bayes with different datasets.
7. Apply ZeroR, OneR and j4.8, to classify the iris data in an experiment using 10 train and test runs, with 66% of the data used for 34% used for testing.
8. Using Weka Knowledge flow set up a flow to load an ARFF file (batch mode) and perform a cross-validation using j4.8 (WEKS’s C4.5implementation).
9. Draw multiple ROC curves in the same plot window, using j4.8 and RandomForest as classifiers.
10. Use any three clustering algorithm on Vehicle data set and find best among them.

Suggested Readings

1. Steinbach Tan, Kumar, “Introduction to Data Mining”, First edition, Pearson Education; 2016.

2. Mohammed J. Zaki, Wagner Meira, Jr.“Data Mining and Analysis Fundamental Concepts and Algorithms”, Cambridge University Press, May 2014
3. Han, Kamber& Pei, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publisher, Third Edition, 2013
4. G.K. Gupta, "Introduction to Data mining with case studies", 2nd Edition, PHI Private limited, New Delhi, 2011.
5. Arun K Pujari, "Data Mining Techniques", 10th impression, University Press, 2008.

Websites

1. www.geeksforgeeks.org
2. www.tutorialride.com
3. www.javatpoint.com

Semester – VI

21CSU612A Information Security and Cyber Laws - Practical 4H – 2C

Instruction Hours / week:L: 0 T: 0 P: 4 **Marks:**Internal :**40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
- To explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
- To understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications
- To use various tools to implement various cryptographic algorithms.

Course Outcomes(COs)

A student who successfully completes this course should at a minimum be able to:

1. Explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
2. State the basic concepts in information security
3. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
4. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
5. Understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications
6. Use various tools to implement various cryptographic algorithms.

List of Programs

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.

SUGGESTED READINGS

1. M. Merkow, J. Breithaupt. 2005. Information Security Principles and Practices. Pearson Education. 2005.
2. G.R.F. Snyder, T. Pardoe. 2010. Network Security. Cengage Learning.
3. A. Basta, W.Halton. 2008. Computer Security: Concepts, Issues and Implementation. Cengage Learning India.
4. Nina Godbole & SUNIT Belapure.(2013) CYBER SECURITY. Wiley India Pvt.Ltd.New Delhi.

WEB SITES

1. http://www.csc.ncsu.edu/faculty/ning
2. csrc.nist.gov/publications/nistpubs/800-12/handbook.pdf
3. www2.warwick.ac.uk/fac/sci/dcs/teaching/modules/cs134/

Semester – VI

21CSU612B Digital Image Processing - Practical 4H – 2C

Instruction Hours / week: L: T: 0 P: 4 **Marks:** Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To know the usage of SCILAB/MATLAB image processing algorithms and tools.
- To design and conduct experiments, as well as to analyze and interpret data

Course Outcomes (COs)

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

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

List of Programs

1. Write program to read and display digital image using MATLAB or SCILAB
   a. Become familiar with SCILAB/MATLAB Basic commands
   b. Read and display image in SCILAB/MATLAB
   c. Resize given image
   d. Convert given color image into gray-scale image
   e. Convert given color/gray-scale image into black & white image
   f. Draw image profile
   g. Separate color image in three R G & B planes
   h. Create color image using R, G and B three separate planes
   i. Flow control and LOOP in SCILAB
   j. Write given 2-D data in image file
2. To write and execute image processing programs using point processing method
   a. Obtain Negative image c. Obtain Flip image
   b. Thresholding d. Contrast stretching
3. To write and execute programs for image arithmetic operations
   a. Addition of two images
   b. Subtract one image from other image
   c. Calculate mean value of image
   d. Different Brightness by changing mean value
4. To write and execute programs for image logical operations
   a. AND operation between two images
   b. OR operation between two images
   c. Calculate intersection of two images
   d. Water Marking using EX-OR operation

e. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
   a. Standard MATLAB function
   b. Program without using standard MATLAB functions
   c. C Program
6. To write and execute program for geometric transformation of image
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming
7. To understand various image noise models and to write programs for
   a. image restoration
   b. Remove Salt and Pepper Noise
   c. Minimize Gaussian noise
   d. Median filter and Weiner filter
8. Write and execute programs to remove noise using spatial filters
   a. Understand 1-D and 2-D convolution process
   b. Use 3x3 Mask for low pass filter and high pass filter
9. Write and execute programs for image frequency domain filtering
   a. Apply FFT on given image
   b. Perform low pass and high pass filtering in frequency domain
   c. Apply IFFT to reconstruct image
10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask
11. Write and execute program for image morphological operations erosion and dilation.
12. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

Suggested Readings

1. Gonzalez, R. C., & Woods, R. E. (2008). Digital Image Processing(3rd ed.). New Delhi: Pearson Education.
2. Jain, A. K. (1989). Fundamentals of Digital image Processing. New Delhi: Prentice Hall of India.
3. Castleman, K. R. (1996). Digital Image Processing. New Delhi: Pearson Education.
4. Schalkoff. (1989). Digital Image Processing and Computer Vision. New York: John Wiley and Sons.
5. Rafael, C. Gonzalez., Richard, E. Woods.,& Steven Eddins. (2004). Digital Image Processing using MATLAB. New Delhi: Pearson Education.

Websites

1. http://www.imageprocessingplace.com/DIP-3E/dip3e_classroom_presentations_downloads.htm
2. https://www.tutorialspoint.com/dip/index.htm
3. https://www.javatpoint.com/digital-image-processing-tutorial

Semester – VI

21CSU613A Internet Technologies - Practical 3H – 1C

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:**Internal :**40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To get familiar with basics of the Internet Programming.
- To acquire knowledge and skills for creation of web site considering both client and server side programming
- To gain ability to develop responsive web applications using JavaScript
- To develop advanced Java applications using JDBC
- To learn and create JSP applications
- To develop the component based applications using Java Beans

Course Outcomes(COs)

1. Familiarize with the basics of the Internet Programming.
2. Acquires knowledge and skills for creation of web site considering both client and server side programming
3. Ability to develop responsive web applications using JavaScript
4. Develop advanced Java applications using JDBC
5. Understand and create JSP applications
6. Develop the component based applications using Java Beans

List of Programs

Create event driven program for following:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
2. Print the largest of three numbers.
3. Find the factorial of a number n.
4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
5. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

SUGGESTED READINGS

1. Ivan Bayross. 2009. Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications.
2. Cay Horstmann. BIG Java. Wiley Publication. 2009. 3rd Edition.
3. Herbert Schildt. 2009. Java 7. The Complete Reference.8th Edition.
4. Jim Keogh. 2002. The Complete Reference. J2EE. TMH.
5. O'Reilly. 2003. Java Server Pages. Hans Bergsten. Third Edition.

WEBSITES

1. www.ntu.edu.sg/home/ehchua/programming/java/JSPByExample.html
2. https://docs.oracle.com/cd/E15523_01/web.1111/e13712/reference.htm
3. https://www.tutorialspoint.com/jsp/jsp_quick_guide.htm

Semester – VI

21CSU613B E-Commerce Technologies - Practical 3H – 1C

Instruction Hours / week: L: T: 0 P: 3 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives

- To design components, systems and/or processes to meet required specifications for a web presence.
- To understand the foundation and importance of E-Commerce.
- To analyze the impact of E-Commerce on business models & strategy.
- To recognize and analyze the branding and pricing strategies.
- To appreciate ethical implications of professional practice
- To use Client-side scripting JavaScript, VB Script and CSS to develop e-commerce applications
- To use Server-side scripting ASP.Net to develop -commerce applications

Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Understand the process of setting up an interactive web site, displaying product catalogue, deploying shopping carts, handling credit card transaction.
2. Analysis theoretical and practical issues of conducting business over the internet and the web.
3. Identify the major electronic payment issues and options.
4. Reflect on general principles revealed through practical exploration of specific tools, techniques and methods in e-business.
5. Demonstrate effective and integrative team-work.
6. To design and develop e-commerce applications using JavaScript, ASP.Net, CSS

List of Programs

1. Write a HTML program to implement the use of Image map.
2. Write a CSS to implement selectors in HTML
3. Write a CSS to implement pesudo – classes with in-line styles
4. Write a Javascript program to validate a web form
5. Write a Javascript program to allow visitors to see history of visiting your page
6. Write a Javascript program to change random color each 5 seconds
7. Write a Javascript program to create multiplication table.
8. Write a Javascript program to create a website for an Organisation.
9. Write a program to create a logo for a company using Javascript and CSS.
10. Write VBScript program to print Fibonacci series using Do..while loop and For loop.
11. Write VBScript program to generate date and time in different format.
12. Write VBScript program to print student marklist.
13. Develop an ASP code to retrieve information from forms.
14. Develop an ASP code to reading and writing cookies information.
15. Develop an ASP code using response object methods.

Suggested Readings:

1. Bharat Bhasker , " Electronic Commerce: Framework, Technologies and Applications",

McGraw Hill Education; Fourth edition (July 2017).
2. Gaurav Gupta and Sarika Gupta ," E-Commerce", Khanna Book Publishing Company; Second edition (2015).
3. M. Suman & N. **Divakara Reddy,** "Advanced E-commerce and mobile commerce", Himalaya Publishing House (September 2015).

Web Sites

1. https://thinkmobiles.com/blog/mcommerce-benefits/
2. http://172.16.25.76/course/view.php?id=1987
3. https://www.practicalecommerce.com/Mobile-Commerce-Four-Good-Examples
4. https://www.bigcommerce.com/blog/mobile-commerce/
5. http://www.dynamicwebs.com.au/tutorials/e-commerce.htm
6. https://bizibl.com/commerce/download/mobile-commerce-guide-making-business-case-mobile-commerce-creating-effective

Semester-VI

21CSU691	**PROJECT**	**8H-6C**

Instruction Hours / week: L: 8 T: 0 P: 0 **Marks: Int: 40 Ext: 60** **Total: 100**

End Semester Exam: 3 Hours