KARNATAK UNIVERSITY DHARWAD

Regulations and Syllabus

for the Programme

BACHELOR OF COMPUTER SCIENCE (B.Sc.(CS))

(I TO VI Semester)

Revised Syllabus

Under

Choice Based Credit System

From 2020-21 and Onwards

Regulations Governing Under – Graduate Programmes in the

Faculty of Science & Technology under Choice Based Credit System

(As per Section 44(1)(c) of K.S.U. Act 2000)

1. TITLE AND COMMENCEMENT

a. These regulations shall be called "Regulations governing the acts of the Choice Based Credit System (CBCS) for under graduate programmes (General)" of Karnatak University, Dharwad.

b. These regulations shall be as per section 44(1)(c) of K.S.U. Act 2000 for introduction of courses.

c. As per Section 44(3) of K.S.U. Act 2000, these Regulations shall come into effect from the academic year: 2020-21 after H.E. the Chancellor's assent.

The sections with titles of Regulations for Under Gradate Programmes (General)

2. UNDER GRADUATE PROGRAMME (U. G. Degree)

Bachelor of Computer Science (**B.Sc.(CS)**) : 06 semesters

3. PROGRAMME STRUCTURE

3.1: B.Sc.(CS) programme shall have three components, Viz., Discipline Specific Courses (DSC), Elective Courses (EC), and Ability Enhancement Courses (AEC) as given in Annexures-1 (Course means subject/paper).

a. DSC: DSC are compulsory core courses of the programme.

b. EC: Elective courses may have three categories' viz., Discipline Specific Elective (DSE) Course, Dissertation/Project and Generic Elective (GE) Course.

    i. DSE: Elective courses offered under the main discipline/subject of study are referred to as Discipline Specific Elective (DSE).

    ii. Dissertation/Project: An elective course designed to acquire special/ advanced knowledge, such as supplement study/support study to a project work, and a candidate study such a course on his/her own with an advisory support by a teacher/faculty member is called Dissertation/project.

c. Ability Enhancement Courses (AEC): The Ability Enhancement Courses (AEC) may be of two kinds: i) Ability Enhancement Compulsory Courses (AECC) and ii) Skill Enhancement Courses (SEC).

i. Ability Enhancement Compulsory Courses (AECC): Environmental Science, Indian constitution, English Communication and Modern Indian languages (MIL) Communications.

P.S:. 1) A deaf / spastic /mentally retarded/learning deficiency student shall be exempted from learning any one of the languages like English or MIL.
2) MIL means any one language mentioned in VIII schedule of Indian Constitution.

ii. Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge and should contain theory and lab/hands-on training/ fieldwork (Annexure2).

3.2: Programme shall have two components (L: T/P): i) Lecturing (L) and ii) Tutorial (T) for non practical subjects and Practical (P) for practical subjects. Tutorial consists of participatory discussions, seminar presentations, desk work etc by the students of the respective subjects.

P.S: There shall not be a tutorial for Practical subjects

3.3: Credit system of the programme: B.Sc.(CS) programme shall have 144 credits for 06 semesters. Credit means the unit by which a course is measured.

a. 1 hour lecture or 1 hour tutorial of session per week is equal to 1 credit and that of 2 hours practical is equal to 1 credit. Credit for each course shall be decided by BoS.

b. Course (subject) of 3 to 6 credits each shall be evaluated for 100 marks and that of less than 3 credits including practical shall be evaluated for 50 marks. Further, the project work /dissertation shall have 6 credits and be evaluated for 100 marks.

4: WORKLOAD FOR TEACHERS

4.1: Each theory session may have 40 students extendable to 45 students for B.Sc.(CS) program Irrespective of DSC, DSE, SEC, and AEC in the class rooms.

4.2: There shall be one teacher for first 15 students, 02 teachers up to 27, 03 teachers up to 36 and 4 teachers up to 46 students in a practical batch.

4.3: In general there shall be

i. One hour theory class per week is equal to one hour work load per week.
ii. One hour tutorial per week is equal to one hour work load per week.
iii. One hour practical class per week is equal to one hour work load per week.

5. ADMISSION PROCEDURE FOR B.Sc.(CS) PROGRAMME

5.1: Invitation of Applications: University shall issue a notification for admission to various U G Programmes for all odd semesters soon after declaration of PUC II year / 10+2 results,

a. Notification shall include eligibility for admission to different programmes, detailed fee structure, calendar of academic events for odd and even semesters of the academic year, last date for admission with or without panel fees, remittance of fees to University etc.
b. Admissions shall be purely based on merit cum reservation as per the norms of Government of Karnataka issued from time to time.
c. Academic year normally commences in the month of June every year. Exact date for commencement of academic year shall be decided by the University.
d. Affiliated colleges shall admit the students for each programme not exceeding the approved number of students. Hence, prior approval in this connection from University is mandatory.

5.2: ELIGIBILITY:

A candidate who has passed two years Pre University Course (PUC) Examination conducted by Pre University Board, Government of Karnataka, Bengaluru or 10+2 Examination conducted by CBSE or equivalent examinations by other states or any other recognized Boards / Departments shall be eligible for admission to first semester B.Sc(CS) Programme. Further,

a. For B.Sc.(CS) Programme, a candidate of PUC / 10+2 with Science or equivalent securing minimum of 35% of marks are eligible for admission.

5.3: Admissions for higher Semesters:

a. B.Sc.(CS) Programme shall be carryover system.

b. 75% attendance shall be mandatory for each semester and for each paper to appear for semester end examination. Further, 20% attendance shall be condoned for the students involved in co curricular/ curricular activities through NCC/NSS/ Sports/ Cultural activities/ Study tours/ field work/ attending seminars with the due permission from the Principal in writing.

c. A candidate shall be eligible to move to higher semester even if the candidate passes / fails in such semester end examination conducted by the University.

d. If the candidate fails to appear for the semester end examination but make application to appear for the examination by maintaining 75 % attendance is also eligible to get the admission to immediate next higher semester admission.

P.S: 1) Mere submission of application by the candidate to appear for examination without maintaining 75% attendance shall not be eligible for higher semester. 2) If candidate maintains 75% attendance but fails to submit the application to appear for semester end examination shall not be eligible for higher semester admission.

e. If the candidate appears for I semester end examination and discontinued for II semester and wishes to take admission for II semester in future, such candidates shall not be allowed for II semester directly. Such candidate shall again get the admission to I semester only by surrendering his/her I semester marks card to University. This is also applicable to other even semesters like IV and VI semesters wherein candidate shall get admission to III semester and V if discontinued to IV and VI semesters respectively.

f. If the candidate appears for II semester end examination and discontinued for III semester and wishes to take admission for IV semester in future, such candidates shall not be allowed for IV semester. Such candidate shall again get the admission to III semester as per University schedule. This is also applicable to other odd semester like V semester wherein candidate gets admission to V semester if discontinued at VI.

g. A candidate who does not satisfy the requirement 75% attendance even in one course (subject / paper) shall not be permitted to take the whole University examination of that semester and he/she shall seek re-admission to that Semester in a subsequent year as per University schedule.

5.4: Medium of instruction: English

5.5: Change of Programme:

Every U. G. Programme is specific in nature and hence, there shall not be any provision to change the programme.

5.6: Change of subject:

The MIL subject studied by the candidate in I semester shall be the same for all other semesters and hence, there shall not be any provision to change the MIL subject.

5.7: Change of College/ Transfer

a. Candidate shall be permitted for change of college only for the odd semesters by admitting within the stipulated period mentioned in the admission notification with the due consent from both the colleges. There shall not be any provision for transfer / change of college for even semesters. Further, lower semester examination failure / MPC candidates are not eligible for transfer / change of college within the Karnatak University's affiliated colleges.

b. The same shall be applicable for the candidate seeking transfer from the colleges of other University within or outside the state or country by producing the eligibility certificate issued by Karnatak University with the confirmation of similarity of the programmes with each other. Other conditions shall be same as in 5.7(a).

c. Such transfer of admission shall be within the intake capacity of the respective class/ subject of the respective College.

6: EXAMINATION

6.1: Course (subject) of 3 to 6 credits each shall be evaluated for 100 marks and that of less than 3 credits including practical shall be evaluated for 50 marks. Further, the project work /dissertation shall have 6 credits and be evaluated for 100 marks.

6.2: There shall be a continuous assessment mode for the student. For this purpose, semester examinations are divided in to two components viz.,

a. Internal assessment written examinations conducted at college level for 20% of maximum marks allotted for each course (paper/subject) and

b. Semester end written examination conducted by University after 16th week of the commencement of every semester for 80% of maximum marks allotted for each course (paper/subject).

6.3: Internal assessment (IA) examinations:

a. **Theory Papers:** The College shall conduct IA examination for theory subjects in the 8th week for 10% and 12th week for remaining 10% of maximum marks allotted for each paper/subject. Duration of examination shall be 1hr. each.

b. **Practical:** The College shall conduct IA examination for practical paper in the 14th week for 20% of maximum marks allotted for each paper/subject. Duration of examination shall be 3hr.

c. **Project work /dissertation:** The College shall conduct IA examination for Project work /dissertation in the 14th week for 20% of maximum marks allotted for each Project work /dissertation. Duration of examination shall be 1hr.

d. Concerned teacher shall display the marks on notice board within 4 days after IA examination and allow the student for verification of IA Booklet if he wishes. Grievances, if any, shall be solved by the concerned teachers, further if any by the Principal/ representative of Principal as per internal mechanism of the College.

e. There shall not be any provision for makeup examination for IA examinations for improvement of IA marks or for remaining absent. However, IA exam shall be conducted for the students who remained absent due to participation in the events related to co curricular / curricular activities conducted by recognized organizations.

f. College shall submit the IA marks to the University if student satisfies 75% attendance in the semester and shall be eligible to appear for semester end examination.

6.4: Semester end examination:

Semester end examination shall be conducted by University after 16th week of the commencement of every semester for 80% of maximum marks allotted for each paper. Further, the University shall conduct the semester end examination of the respective semesters only; may be odd or even but not both odd and even semesters simultaneously unless specified otherwise.

a. Duration of theory examination shall be 03 hours for 100 marks subject/ paper/ course (including IA marks) having the credit 3 to 6.

b. Duration of theory examination shall be 1.5 hours for 50 marks subject /paper / course(including IA marks) having the credit less than 3.

c. Duration of practical examination shall be 3 hours for 50 marks subject /paper / course(including IA marks) having the credit less than 3.

d. BoS in consultation with the concerned faculty shall decide the pattern of question paper for uniformity for all the core courses and elective courses.

e. Question papers shall be prepared by team of members of respective Board of Examiners (BoE).

f. Concerned BoE shall decide the scheme of valuation of both theory and practical course papers.

g. There shall be a single valuation for theory papers from the members of concerned BoE under the supervision of moderator who is in turn under the supervision of Chairman of BoE.

h. Practical / evaluation of project / dissertation work shall be conducted before the commencement of theory examination at the concerned colleges by two examiners; one from the same college as internal examiner and other from other colleges appointed by University as external examiner. Further, there may be two external examiners but not two internal examiners to conduct the examination. A pair of examiners shall conduct practical examination for two batches par day having maximum 12 students in each batch.

6.5: Passing criteria

a. Candidate has to score 40% in each course (subject) including the IA marks for passing the course (subject) subject to the condition that:

  i. No minimum marks or separate passing for the IA examination, but candidate has to score minimum 40% from the semester end examination for its 80% of the maximum marks and fulfils the minimum 40% for maximum marks of the course (subject)(Ex. for 100 marks paper; 20 IA + 80 sem end exam and hence, minimum 32 marks for sem end exam). If candidate scores 40% by cumulating marks from IA and semester end examination but fails to score 40% from the semester end examination, such candidate shall be declared fail.

  ii. If the course (subject) is having both theory and practical, candidate has to pass both theory and practical independently. If the candidate fails in Practical and passes in theory examination, such candidate shall reappear for practical examination only and vice versa.

  iii. In all cases of failure in particular course (subject), IA marks shall be protected and carried forward; and the candidate need not reappear for IA examinations in such cases.

b. On successful scoring of minimum 40% in all courses (Subject), the candidate shall be declared pass in the programme in that semester.

c. On successful scoring of minimum 40% in all courses (Subject) and all the semesters, the candidate shall be declared pass in the entire programme.

6.6: Percentage and Grading

a. If P is the percentage of marks secured (IA + semester end score) by the candidate in a course(subject) which is rounded off to the nearest integer, the grade(G) earned by the candidate in that course(subject) will be given as below:

Percentage(P)	Grade(G)	Percentage(P)	Grade(G)
40 – 49	5.0	75 – 79	8.0
50 – 59	6.0	80 – 84	8.5
60 – 64	6.5	85 – 89	9.0
65 – 69	7.0	90 – 94	9,5
70 – 74	7.5	95 – 100	10.0

Grade point of less than 5 shall be considered as fail in the course (subject). Hence, P=0 and G=0 for the absent also.

b. A student's level of competence shall be categorized by grade point (GP), Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) of the programme.

c. Semester Grade Point Average (SGPA): The SGPA is a ratio of sum of the number of Credit grade points scored from all the courses (subject) of given semester to the total credits of such semester in which the candidate studied. (Credit grade points of each course (subject)= Credit x GP)

d. Cumulative Grade Point Average (CGPA): It is calculated as below for 6 semester programme.

$$CGPA = \frac{\{(Credit_1 * SGPA_1) + (Credit_2 * SGPA_2) + (Credit_3 * SGPA_3) + (Credit_4 * SGPA_4) + (Credit_5 * SGPA_5) + (Credit_6 * SGPA_6)\}}{\text{Total credits of programme (sum of credits of all semesters)}}$$

e. After studying and passing all the credits prescribed for the programme the degree shall be awarded with CGPA score and class distinguishing as second class, first class, and distinction along with grade letter as under.

CGPA of the Programme (UG)	Class Obtained	Grade Letter
9.50 to 10.00	Distinction	A++
9.00 to 9.49	Distinction	A+
8.00 to 8.99	Distinction	A
7.00 to 7.99	First Class	B+
6.00 to 6.99	First Class	B
5.00 to 5.99	Second Class	C
Less than 5.00	Fail	D

6.7. CRITERIA FOR AWARD OF DEGREE

On successful scoring of minimum 5 grade points in all courses of the programme, the respective degree shall be awarded for the candidates. The University shall issue the final grade card (Marks card) consisting of grade points along with marks of all courses successfully completed, SGPA for all the semesters, CGPA with Grade letter of the entire programme and Class obtained.

The degree shall be awarded in the Annual / Special convocation. The Degree certificate shall consist of CGPA of the programme and Class obtained.

6.8: Recounting, revaluation, challenge valuation, photo copying of answer papers

There shall be provision for recounting of marks, revaluation, challenge valuation and photo copying of answer papers. The University shall invite applications for such purpose immediately after announcing the results for every semester by giving 10 days

time to apply for the same online as per the existing ordinance and regulations and process the same accordingly.

6.9: Rank and Gold medals.

Students shall be considered for Ranks and/or Gold medals for only those who are completing all the credits in 6 semesters (6 semesters Programme) without break in the examination. However, this is not applicable for the award of classes like, second/first class/ distinction to the students.

6.10: Makeup Examination.

   a. There shall be no immediate makeup examination for all semesters to the courses where candidate failed to score minimum 40% for semester end examination unless specified otherwise as in (c).

   b. However, such candidate shall appear for examination during the regular schedule of examination conducted by the University.

   c. There shall be a makeup examination for the V and VI semesters immediately after declaring the final semester results of the programme.

7: Provision for improvement of the marks (Grade Point)

Improvement of the marks (Grade Point): There shall be a provision for candidates to reappear for the examination for the concerned course of theory papers only (subject) in which candidate wishes for improvement of his/ her grade point of SGPA in general and CGPA in total of the programme subject to the condition that:

   a. The candidate shall be eligible to reappear for improvement of grade points only after successfully passing the programme.

   b. The candidate may opt for the examination for any number of courses (subject / paper) of the programme for improvement of grade point but not more than three times for each course (subject / paper) as per the prevailing syllabus of the examination conducted in the regular schedule of University examinations.

   c. All such provisions are there within 03 years from successful completion of the programme but not exceeding the period of double the duration of completion of the programme.

   d. In all such cases grade points are considered if there is a progress in such improvements, otherwise original grade points shall be retained.

   e. No such candidates shall be eligible for the award of Rank, Gold Medal, Cash Prize, etc.

8: Duration for completion of the U. G. Programme

Minimum duration for completion of B.Sc.(CS) UG Programme shall be 3 years from the date of admission to I semester, but the maximum duration shall be 6 years, i.e., double the duration of programme.

9: REPEAL AND SAVINGS FOR UG PROGRAMMES

All the existing Regulations governing three years Bachelor degree programme in the discipline of Science under semester or any ordinances or regulations or guidelines issued or adopted earlier by the University in this matter for constituent and affiliated colleges of Karnatak University are hereby repealed. However, the above Regulations shall continue to be in force for the students who have been admitted to the degree programme concerned before the enforcement of these new regulations.

Provided that the said repeal shall not affect the previous operation of the said regulations / ordinances or anything duly done or suffered there under or affect any right, liability or obligation acquired, accrued or incurred under the said regulations.

10: Removal of Difficulties:

Any issue not specifically mentioned in these Regulations shall be decided by the Vice Chancellor as per K.S.U 2000 Act.
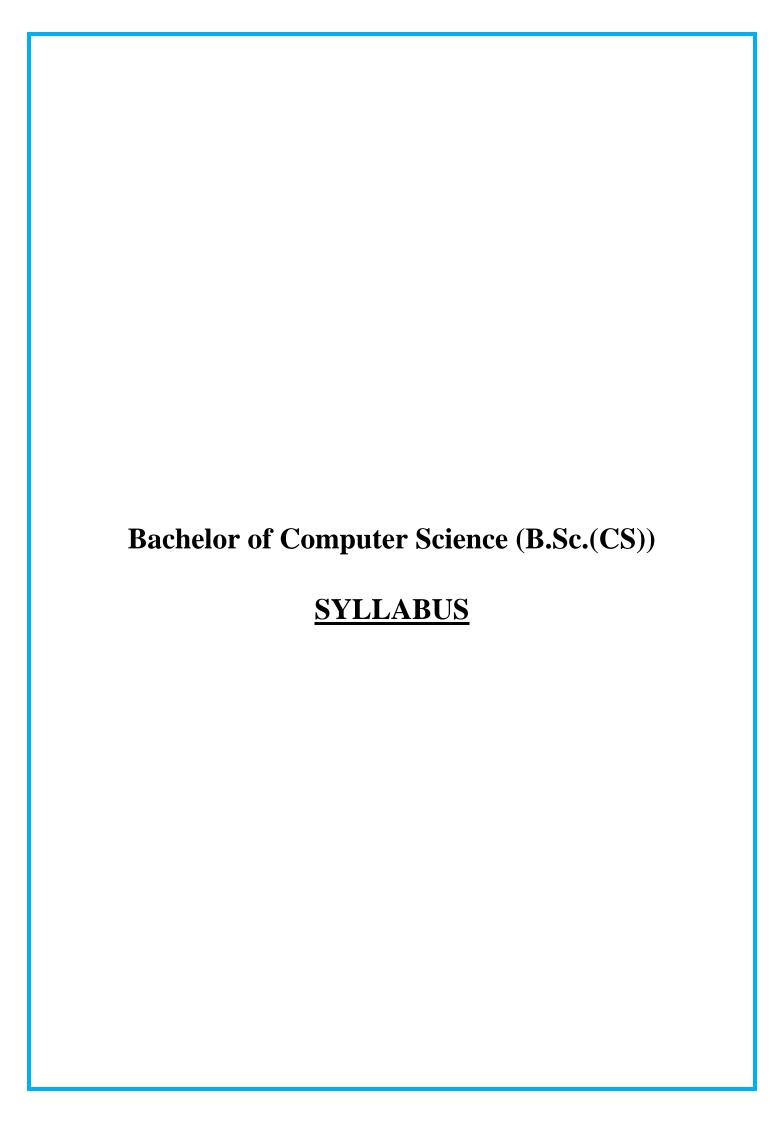
B.Sc.(CS) Programme structure under CBCS

| Semester | *Core | | | Elective | | | Ability Enhancement Course | | | | | | Total Credits |
| | DSC | | | **DSE | | | SEC | | | AECC | | | |
	Course	L+T+P	Credit	Course	L+T+P	Credit	Course	L+T+P	Credit	Course	L+T+P	Credit	
I	DSC-1A	4+0+4	4+2=6							English-1	2+1+0	2+1=3	
	DSC-2A	4+0+4	4+2=6							MIL-1	2+1+0	2+1=3	26
	DSC-3A	4+2+6	4+2=6							ENVIRONMENTAL SCIENCE	2+0+0	2+0=2	
II	DSC-1B	4+0+4	4+2=6							English-2	2+1+0	2+1=3	
	DSC-2B	4+0+4	4+2=6							MIL-2	2+1+0	2+1=3	26
	DSC-3B	4+2+0	4+2=6							CONSTITUTION OF INDIA	2+0+0	2+0=2	
III	DSC-1C	4+0+4	4+2=6							English-3	2+1+0	2+1=3	
	DSC-2C	4+0+4	4+2=6							MIL-3	2+1+0	2+1=3	26
	DSC-3C	3+1+0	3+1=4										
	DSC-4C	3+1+0	3+1=4										
IV	DSC-1D	4+0+4	4+2=6							English-4	2+1=0	2+1=3	
	DSC-2D	4+0+4	4+2=6							MIL-4	2+1=0	2+1=3	26
	DSC-3D	3+1+0	3+1=4										
	DSC-4D	3+1+0	3+1=4										
V	DSC-1E	4+0+2	4+2=6	DSE-1E	3+1+0	3+1=4	SEC-1E	0+0+4	2				
				DSE-2E	3+1+0	3+1=4							20
				DSE-3E	3+1+0	3+1=4							
VI	DSC-1F	4+0+2	4+2=6	DSE-1F	3+1+0	3+1=4	SEC-1F	0+0+4	2				
				DSE-2F	3+1+0	3+1=4							20
				DSE-3F	3+1+0	3+1=4							
TOTAL			88			24			04			28	144

L+T+P= Lecturing in Theory + Tutorial + Practical Hours per Week (no tutorial for practical subject).
    * Each semester may have more than three core (DSC) subjects but not exceeding 18 credits for each semester.
    ** Each DSE shall have at least two papers and student shall choose any one paper from each DSE.

Bachelor of Computer Science (B.Sc.(CS))

<u>SYLLABUS</u>

SEMESTER - I

Paper Code	Paper Title Theory/Practical	Credits	No. of Hrs/ Week Theory/ Practical	Total Hours	Duration of Exam in Hrs Theory/ Practical	Internal Assessment Marks Theory/ Practical	Marks for Final Exam Theory/ Practical	Total Marks
B.Sc.(CS)-1.1	English – 1	3	3	45	3	20	80	100
B.Sc.(CS)-1.2	MIL -1	3	3	45	3	20	80	100
B.Sc.(CS)-1.3	Indian Constitution	2	2	30	1.5	10	40	50
B.Sc.(CS)-1.4	Problem Solving Technique using C-Programming	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-1.5	Computer Oriented Numerical Methods	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-1.6	Introduction to Linux	4 + 2	6	48	3	20	80	100
B.Sc.(CS)-1.7	C-Programming LAB	2	4	48	3	10	40	50
B.Sc.(CS)-1.8	Numerical Methods LAB	2	4	48	3	10	40	50
	Total	26	30			130	520	650

SEMESTER - II

Paper Code	Paper Title Theory/Practical	Credits	No. of Hrs/ Week Theory/ Practical	Total Hours	Duration of Exam in Hrs Theory/ Practical	Internal Assessment Marks Theory/ Practical	Marks for Final Exam Theory/ Practical	Total Marks
B.Sc.(CS)-2.1	English – 2	3	3	45	3	20	80	100
B.Sc.(CS)-2.2	MIL -2	3	3	45	3	20	80	100
B.Sc.(CS)-2.3	Human Rights & Env. Studies	2	2	30	1.5	10	40	50
B.Sc.(CS)-2.4	Probability & Statistics	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-2.5	OOP with C++	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-2.6	Discrete Mathematical Structure	4 + 2	6	48	3	20	80	100
B.Sc.(CS)-2.7	Statistical Methods LAB	2	4	48	3	10	40	50
B.Sc.(CS)-2.8	C ++ Lab	2	4	48	3	10	40	50
	Total	26	30			130	520	650

SEMESTER - III

Paper Code	Paper Title Theory/Practical	Credits	No. of Hrs/ Week Theory/ Practical	Total Hours	Duration of Exam in Hrs Theory/ Practical	Internal Assessment Marks Theory/ Practical	Marks for Final Exam Theory/ Practical	Total Marks
B.Sc.(CS)-3.1	English - 3	3	3	45	3	20	80	100
B.Sc.(CS)-3.2	MIL – 3	3	3	45	3	20	80	100
B.Sc.(CS)-3.3	Data Structures using C	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-3.4	Microprocessor 8085	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-3.5	Fundamentals of Digital Electronics	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-3.6	Data Communication	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-3.7	Data Structures Lab	2	4	48	3	10	40	50
B.Sc.(CS)-3.8	Microprocessor Lab	2	4	48	3	10	40	50
	Total	**26**	**30**			**140**	**560**	**700**

SEMESTER - IV

Paper Code	Paper Title Theory/Practical	Credits	No. of Hrs/ Week Theory/ Practical	Total Hours	Duration of Exam in Hrs Theory/ Practical	Internal Assessment Marks Theory/ Practical	Marks for Final Exam Theory/ Practical	Total Marks
B.Sc.(CS)-4.1	English - 4	3	3	45	3	20	80	100
B.Sc.(CS)-4.2	MIL – 4	3	3	45	3	20	80	100
B.Sc.(CS)-4.3	Data Base Management System	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-4.4	Core JAVA	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-4.5	Operation Research	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-4.6	Software Engineering	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-4.7	DBMS LAB	2	4	48	3	10	40	50
B.Sc.(CS)-4.8	Core Java LAB	2	4	48	3	10	40	50
	Total	26	30			140	560	700

SEMESTER - V

Paper Code	Paper Title Theory/Practical	Credits	No. of Hrs/ Week Theory/ Practical	Total Hours	Duration of Exam in Hrs Theory/ Practical	Internal Assessment Marks Theory/ Practical	Marks for Final Exam Theory/ Practical	Total Marks
B.Sc.(CS)-5.1	Web Technologies	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-5.2	Core Elective - 1	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-5.3	Core Elective - 2	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-5.4	Core Elective - 3	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-5.5	Mini Project - 1	2	4	48	3	10	40	50
B.Sc.(CS)-5.6	Web Designing LAB	2	4	48	3	10	40	50
	Total	20	24			100	400	600

List of Core Elective - 1

Sl. No.	Elective Courses Code	Core Electives (One of the following elective to be chosen)
1	B.Sc.(CS)E – 5.2 A	Management Information System
2	B.Sc.(CS)E – 5.2 B	Managerial Economics
3	B.Sc.(CS)E – 5.2 C	Decision Support System

List of Core Elective - 2

Sl. No.	Elective Courses Code	Core Electives (One of the following elective to be chosen)
1	B.Sc.(CS)E – 5.3 A	Computer Graphics
2	B.Sc.(CS)E – 5.3 B	Computer Networks
3	B.Sc.(CS)E – 5.3 C	Object Oriented Analysis & Design

List of Core Elective - 3

Sl. No.	Elective Courses Code	Core Electives (One of the following elective to be chosen)
1	B.Sc.(CS)E – 5.4 A	Artificial Intelligence
2	B.Sc.(CS)E – 5.4 B	Introduction to Machine Learning
3	B.Sc.(CS)E – 5.4 C	Internet of Things

SEMESTER - VI

Paper Code	Paper Title Theory/Practical	Credits	No. of Hrs/ Week Theory/ Practical	Total Hours	Duration of Exam in Hrs Theory/ Practical	Internal Assessment Marks Theory/ Practical	Marks for Final Exam Theory/ Practical	Total Marks
B.Sc.(CS)-6.1	Python Programming	4 + 0	4	48	3	20	80	100
B.Sc.(CS)-6.2	Core Elective - 1	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-6.3	Core Elective - 2	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-6.4	Core Elective - 3	3 + 1	4	48	3	20	80	100
B.Sc.(CS)-6.5	Mini Project - 2	2	4	48	3	10	40	50
B.Sc.(CS)-6.6	Python Programming LAB	2	4	48	3	10	40	50
	Total	**20**	**24**			**100**	**400**	**600**

List of Core Elective - 1

Sl. No.	Elective Courses Code	Core Electives (One of the following elective to be chosen)
1	B.Sc.(CS)E – 6.2 A	Data Mining
2	B.Sc.(CS)E – 6.2 B	Mobile Communications
3	B.Sc.(CS)E – 6.2 C	Design and Analysis of Algorithm

List of Core Elective - 2

Sl. No.	Elective Courses Code	Core Electives (One of the following elective to be chosen)
1	B.Sc.(CS)E – 6.3 A	Computer Vision
2	B.Sc.(CS)E – 6.3 B	Cyber Security
3	B.Sc.(CS)E – 6.3 C	Network Security

List of Core Elective - 3

Sl. No.	Elective Courses Code	Core Electives (One of the following elective to be chosen)
1	B.Sc.(CS)E – 6.4 A	Mobile Application Development
2	B.Sc.(CS)E – 6.4 B	Cloud Computing
3	B.Sc.(CS)E – 6.4 C	System Programming

SEMESTER - I

B.Sc.(CS)-1.1-AECC-1: ENGLISH-1

(English-I – Syllabus is decided by respective BoS)

B.Sc.(CS)-1.2- AECC-2: MIL-1

(MIL – Syllabus is decided by respective BoS)

B.Sc.(CS)-1.3- AECC-3: INDIAN CONSTITUTION

(Indian Constitution – Syllabus is decided by respective BoS)

B.Sc.(CS)-1.4 - DSC-1A: PROBLEM SOLVING TECHNIQUE USING 'C' PROGRAMMING

Total: 48 Hrs

UNIT 1:
Computer Concepts: Block diagram of computer system, Central Processing Unit(CPU), ALU, CU, Main memory, Input/Output Unit, **Input devices:** Keyboard, Mouse, Light pen, Joystick, Scanner, Digitizer. **Output devices**: Various types of printers, Plotters, **Software:** System software, Operating System, Application Software, Machine level language, Assembly language, high level programming, Assemblers, compilers and editors, Merits and demerits of all the languages.

(4 Hrs)

UNIT 2:
Computer Programming: Basics Programming concepts- Algorithm, Flowchart. **Overview of C:** Introduction, Importance of C, Sample 'C' programs, Basic structure of C programming, Programming Style, Executing a 'C' program **Data Types in C:** C tokens, Keywords, Identifiers, Constants, Variables, Data types, Declaration of variables, Assigning values to variables, Defining symbolic constants, Simple Programs.
Input and Output statements: Input and Output statements, Reading character, Writing character, formatted input, formatted output statements**.**

(13 Hrs)

UNIT 3:
Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment and Decrement operators, Conditional operators, Bitwise operators, Special operators, Type Conversion in expressions, Operator precedence,

Mathematical functions. **Branching and Looping:** Simple 'if' statement, Simple, Nested, Ladder 'if–else' statement. The 'Switch' statement, The ?; operator, GOTO statement, The 'While' statement, 'do-while' statement, 'for' statement, Simple programs on branching and looping.

(11 Hrs)

UNIT 4:
Arrays: Introduction, One dimensional, Two dimensional and Multi dimensional arrays, Initialization of arrays, **Handling of Character Strings:** Declaring and Initializing string variables, reading string from terminal, writing string to screen, Arithmetic operations on characters, putting strings together, Comparison of two strings, **string handling functions:** strlen, strcpy, strcat, strcmp.

(8Hrs)

UNIT 5:
Functions: Definition of function. Return values and their types, Function calls, Function declaration, Categories of function explanation with example, Nesting of function, Recursion, Faction with arrays. **Structure and Union:** Introduction, Defining Structure, declaring structure variables and structure members, arrays as structure, arrays within structure, Union. Pointers: Understanding Pointers, Accessing the address of variables, Declaring and initializing pointers, Accessing a variable through its pointers.

(12 Hrs)

Text Books:

1. Balaguruswamy: Programming in ANSI C, Tata Mc Graw-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie: The C Programming Language, PHI

Reference:

1. V. Rajaraman: Fundamentals of Computers, PHI(EEE).
2. Kamthane, Programming with ANSI and Turbo C, Pearson Education, Asia.
3. Herbert Schildt: C. The complete reference, 4th edition.
4. Yeshwant Kanetkar: Let us C, BPB Publications.
5. Rajesh Hongal: Computer Concepts and C Programming.

B.Sc.(CS) 1.5-DSC-2A: COMPUTER ORIENTED NUMERICAL METHODS

Total: 48 Hours

UNIT 1:
Solution of Equations(Polynomial and Transcendental equations): Interval Halving Methods, Secant Methods, Regular Falsi Method, Newton's Raphsons Methods, Find Point Iteration Methods, Muller's Method.

(10 Hrs)

UNIT 2:
Solutions of system of Linear Equations: Gaussian Elimination Method, Gauss Iteration Method, Gauss-Jordan, Gauss-Jocobi, Gauss-Siedal Iterative Methods, LU Decomposition Method, Eigen Value and Eigen Vector of a Matrix.

(12 Hrs)

UNIT 3:
Finite Differences: Forward Difference, Backward Differences & Central Differences & operations, Interpolation for Equal Intervals, Newton's Forward Interpolation Formula, Newton's Backward Interpolation Formula, Central differences formula-Gauss forward and backward formula Stiriling's formula ,Bessel's formula, Lagrange Interpolation, Curve fitting by least Squares Method.

(15 Hrs)

UNIT 4:
Numerical Differentiation and Integration: Derivative using Newton's Forward Difference Formula, Derivative using Newton's Backward Difference Formula, Derivative using Sterling's formula, Maxima and Minima, Numerical Integration :General Quadrature formula, Trapezoidal Rule,simpsom's $1/3^{rd}$ Rule, Simpsons $3/8^{th}$ Rule, Weddle's Rule,Euler-Maclaurin summation formula.

(11 Hrs)

Text Books:

1. **"**Numerical Methods", Dr. P.Kandasamy and Dr. K Gunavati, S Chand & Co Ltd, India.
2. "Elementary engineering mathematics" B.S Grewal. Khanna Publisher.

Reference Books:

1. **"**Introductory Methods of Numerical Analysis", 5th edition, S Sastry, PHI.
2. "Numerical Methods for Science and Engineering Computation", M.K. Jain, S.R.K. Iyengar, Wiley Eastern Limited.

B.Sc.(CS)-1.6- DSC-3A: INTRODUCTION TO LINUX

Total: 48 Hrs

UNIT 1:
Introduction to Unix: Brief History, What is Unix?, Unix Components, Using Unix, Commands in Unix, Some Basic Commands, Getting Help, Command Substitution, Giving Multiple Commands, Aliases.

(8 Hrs)

UNIT 2:
Files and File Organization: Unix Files, Categories of Files, Hidden Files, File System, Path Names, Home Directory, Directory Commands, File Related Commands, Wild Cards, Displaying the Contents of a File, Printing of Files, Comparing Files.
File Attributes and Permissions: Ownership of Files, File Attributes, File Command, Changing File Permission, Changing the Owner of a File, Changing the group of a File, Times Associated with a File, umask Command.

(10 Hrs)

UNIT 3:
The vi Editor: vi Editor, Editing with vi, Moving the Cursor, Editing, Copying and Moving Text, Pattern Searching, Repeating the Last Editor Command, Undoing Commands, Joining Lines, Writing Selected Lines onto a Separate File, Using the Shell from vi, Configuring the vi Environment.

(10 Hrs)

UNIT 4:
Regular Expressions: grep Family of Commands and sed : Regular Expressions, grep Family, egrep Command, fgrep Command, Stream Editor-sed.

(5 Hrs)

UNIT 5:
Shell Programming : Shell Variables, export Command, .profile File – A Script Run during Starting, The First Shell Script, read Command, Positional Parameters, The $? Variable – Knowing the Exit Status, More about the set Command, exit Command, Branching Control Structures, Loop-Control Structures, continue and break Statements, expr Command, Real Arithmetic in Shell Programs, The here Document (<<), sleep Command, Debugging Scripts, script Command, eval Command, exec Command.

(15 Hrs)

Text Books:

1. M.G.Venkateshmurthy: Introduction to Unix & Shell Programming, Pearson Education

Reference Books :

1. John Goerzen: Linux Programming Bible, IDG Books, New Delhi.
2. Sumitabha Das: Your Unix - The Ultimate Guide, TMH.
3. Richard Petersen: The Complete Reference – Linux, McGraw-Hill
4. Yashwant Kanetkar: Unix & Shell programming – BPB

B.Sc.(CS)-1.7- DSC-1A (Pr): C- PROGRAMMING LAB

Programs:

1. Write a C program to find the area of a circle given radius.

2. Write a C program to find the area of a triangle given three sides.

3. Write a C program to calculate simple interest and compound interest.

4. Write a C program to convert temperature in Fahrenheit to Celsius and Celsius to Fahrenheit.

5. Write a C program to find the GCD and LCM of two integer numbers.

6. Write a C program to check whether the given integer is even or odd using if condition statement.

7. Write a C program to accept two integers and determine in which quadrant it lies using if ladder.

8. Write a C program to simulate a simple calculator with addition, subtraction, multiplication, division and it should display the error message for division for 0 using switch case.

9. Write a C program to print number from 100 to 200 which are divisible by 7 and display their sum and count using for loop.

10. Write a C program to reverse a given integer number and check whether the number is palindrome or not using while loop.

11. Write a C program the pattern given below using nested for loop

```
1. * * * * *        2. 1
     * * * *             1 2
     * * *               1 2 3
     * *                 1 2 3 4
     *                   1 2 3 4 5
```

12. Write a C program to read N integers (zero, positive and negative) into an array and find sum of positive numbers, sum of negative numbers and average of all numbers.

13. Write a C program to find the addition and subtraction of two matrices.

14. Write a C program to calculate the factorial of a number using function.

15. Write a C program to find if a character is alphabetic or numeric or special character.

16. Write a C program to count the number of vowels, consonants and special characters in a given sentence.

17. Write a C program to accept a sentence and convert all lowercase letters to uppercase letters and vice-versa.

18. Write a C program to find the length of a string using user defined function.

19. Write a program to accept different goods with the number, price and date of purchase, finally display them (using structure).

20. Write a C program to implement array using pointers.

Note: All programs should be carried out on UNIX/LINUX platform

B.Sc.(CS)-1.8- DSC-2A (Pr): NUMERICAL METHODS LAB

Programs:

1. Program to interchange primary and secondary diagonal elements of a square
2. Program to find the row sum, column sum, primary diagonal sum and secondary diagonal sum of a matrix.
3. Program to check whether the given matrix is singular or not.
4. Program to find the addition, subtraction and multiplication of two matrices using functions
5. Program to accept a square matrix and determine whether it is an identity matrix or not.
6. Program to find the root of the equation using Bisection Method.
7. Program to find roots of an eqn f(x) = 0 using Regular-Falsi Method.
8. Program to find the root of the equation using Newton Raphson Method.
9. Program to solve the system eqn Ax = B using Gauss Elimination Method.
10. Program to solve the system eqn Ax = B using Gauss Jacobin Method.
11. Program to solve the system eqn Ax = B using Gauss Seidel Method.
12. Program to find integral of a function using Trapezoidal rule.
13. Program to find integral of a function using Simpson's $1/3^{rd}$ rule.
14. Program to find integral of a function using Simpson's $3/8^{th}$ rule.

Note: All programs should be carried out on UNIX/LINUX platform

SEMESTER - II

B.Sc.(CS) 2.1-AECC-4: ENGLISH-2

(English – Syllabus is decided by respective BoS)

B.Sc.(CS) 2.2-AECC-5: MIL-2

(MIL – Syllabus is decided by respective BoS)

B.Sc.(CS) 2.3-AECC-6: HUMAN RIGHTS AND ENVIRONMENTAL STUDIES

(HR & ES – Syllabus is decided by respective BoS)

B.Sc.(CS) 2.4-DSC-1B: PROBABILITY & STATISTICS

Total: 48 Hours

UNIT 1:
Introduction: Meaning and scope, origin and development of statistics, definition of statistics, importance and scope of statistics, limitations of statistics, distrust of statistics.
Collection of Data: Introduction ,objectives and scope of enquiry, statistical units to be used, source of information(Data),methods of data collection, degree of accuracy aimed at in the final results, types of enquiry, primary and secondary data, choice between primary and secondary data, methods of collecting primary data, direct personal investigation, indirect oral investigation, information received through local agencies, mailed questionnaire method, schedules sent through enumerators, drafting or framing the questionnaire, sources of secondary data, published sources, unpublished sources, precautions in the use of secondary data.

(13 Hrs)

UNIT 2:
Classification and tabulation : Introduction, classification, functions of classifications, rules for classifications, basis of classifications, frequency distributions, array, discrete or ungrouped frequency distribution, grouped frequency distribution, continuous frequency distribution, basic principles for forming a grouped frequency distribution, types of classes, number of classes, size of class intervals, cumulative frequency distribution, less then cumulative frequency, more than cumulative frequency, bivariate frequency distribution, tabulation-meaning and importance, parts of a table, requisites of a good table, type of tabulation.

(9 Hrs)

UNIT 3:

Diagrammatic and graphic representation : Introduction, difference between diagrams and graphs, diagrammatic representation, general rules for construction for diagrams, types of diagrams, one dimensional diagrams, two dimensional diagrams, three dimensional diagrams, pictograms, cartograms, choice of diagrams, graphical representational data, technique of construction of graphs, general for graphing, graphs of frequency distributions, graphs of time series or histograms, semilogarthamic line graphs or ration charts, limitations of diagrams and graphs.

(9 Hrs)

UNIT 4:

Averages: Introduction , requisites of good average or measure of central tendency ,various measure of central tendencies, arithmetic mean, step deviation method for computing arithmetic mean, mathematical properties of arithmetic mean, weighted arithmetic mean, median, partition values, graphic methods of locating partition values, mode, computations of mode, merits and demerits of modes, graphic location of mode, empirical relation between mean(M),median(Md),mode(Mo),Geometric mean, merits and demerits of Geometric mean, compound interest formula, average rate of a variable which increases by different rates at different periods, weighted geometric mean and harmonic mean, merits and demerits of harmonic mean, weighted harmonic mean ,relation between arithmetic mean, geometric mean and harmonic mean and harmonic mean, selection of an average, limitations of averages.

(7 Hrs)

UNIT 5:

Dispertion: Introduction and meaning range, Quartile deviation, Mean deviation and average deviation, standard deviation, Coefficient of variation.

Skweness and Kurtosis: Introduction, Skweness, Moments, Charlier checks. Kurtosis.

(10 Hrs)

<u>**Text Books:**</u>

1. Fundamentals of Statistics by S C Gupta, Himalaya publishing house.

<u>**Reference Books:**</u>

1. Statistical Methods by S P Gupta, Sultan Chand & Sons, 2011
2. Statistical Concept and Application by Nabendu Pal and Sahadeb Sarkar, PHI.

B.Sc.(CS) 2.5-DSC-2B: OOP with C++

Total 48 Hrs

UNIT 1:
Introduction: Procedural languages, definition of OOP, Basic concept of OOP, Object, Class, Data Abstraction, Encapsulation, Data Hiding, member functions, Reusability, Inheritance, Creating new data Type, Polymorphism, Overloading, Dynamic binding, Message Passing**.**
C++ Features: The iostream class, C++ comments, C++ keywords, variable declaration, the const qualifier, the endl, setw, set Precision, Manipulators, The scope resolution operator, the new and delete operators**.**
Functions: Simple functions: function declaration, calling the function, function definition, passing argument to, returning value from function, passing constants, variables, pass by value, passing structure variables, pass by reference, default arguments, return statements, return by reference, overloaded functions, different number of arguments, different kinds of arguments, inline functions. **(10 Hrs)**

UNIT 2:
Objects & Classes: classes & objects, class declaration, class members, data constructors, destructors, member functions, class member visibility: private, public, protected. The scope of the class object constructors, default constructor, constructor with argument, constructor with default arguments, dynamic constructors, copy constructor, overloaded constructor, object as function arguments, member functions defined outside the class, objects as arguments, returning objects from functions, class conversion, manipulating private data members, destructors, classes, objects &memory, array as class member data, Array of objects, string as class member.

(10 Hrs)

UNIT 3:
Operator Overloading: Overloading unary operator, operator keyword, operator arguments, operator return value, nameless temporary objects, limitations of increment operator, overloading binary operator, arithmetic operator, comparison operators, arithmetic assignment operator, Data conversion: conversion between basic to class types, conversion between objects and basic types, conversion between objects of different classes**.**

(8 Hrs)

UNIT 4:
Inheritance: Derived class & Base class: Specifying the derived class accessing the base class members, the protected access specifier, derived class constructor, overriding member functions, public & private inheritance, access combinations, classes & structures, access specifies, level of inheritance: Multilevel inheritance, hybrid inheritance, multiple inheritance, member functions in multiple inheritance, constructors in multiple inheritance, Containership: classes within classes, Inheritance & program development**.**

(10 Hrs)

UNIT 5:
Virtual Functions: Normal member function accessed with pointers, virtual member function accessed with pointers, dynamic binding, pure virtual functions, Friend function: friends for functional notation, friend classes, this pointer, accessing member data with this, using this for returning values**.**
Templates & Exception Handling: Introduction, templates, class templates, function templates, member function templates, template arguments, Exception handling.

(10 Hrs)

Text Book:

1. E.Balaguruswamy: Object oriented Programming with C++ Tata McGraw Hill publications.
2. Lafore Robert: Object oriented Programming in Turbo C++ Galgotia Publications.

Reference Books:

1. Stanley B. Lippman, Josee Lajoie, Barbara E. Moo : C++ primer, 5th Edition, Addison-Wesley.
2. Prata : C++ primer Plus, 4th Edition, Person Education.
3. Strousstrup: The C++ programming Language Pearson Education .

B.Sc.(CS) 2.6-DSC-3B: DISCRETE MATHEMATICAL STUCTURE

Total: 48 Hrs

UNIT 1:
Fundamental principles of counting: The rules of sum and product, Permutations, combinations, the binomial theorem, combinations with repetitions.

(9 Hrs)

UNIT 2:
Fundamental of Logic: Basic connectives and truth tables, Logical equivalence, the laws of logic, logical implication, rules f inference, use of quantifiers, quantifiers, definitions and proofs of theorems.

(12 Hrs)

UNIT 3:
Set theory: sets and subsets, set operations and laws of set theory, counting and venn diagram, Probability.

(8 Hrs)

UNIT 4:

Properties of integers and Mathematical induction: the well-ordering principle, Mathematical induction, recursive definitions, the division algorithm, prime numbers, the GCD, Euclid's algorithm, the fundamental theorem of arithmetic.

(12 Hrs)

UNIT 5:

Relations and functions: Cartesian Products and relations, Functions, plain & one-one function, Onto functions.

(7 Hrs)

Text Books :

1. Ralph. P. Grimaldi, Discrete and Combinational Mathematics, An applied introduction, Pearson Education(LPE) Fourth edition, 4th Indian Reprint.
2. Kolman, Busby & ross, Discrete Mathematical 5/e, Pearson Education .

Reference Books:

1. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill, 1985.
2. Richard Johnsonbaugh, Discrete Mathematics, 5th Edition, Pearson Education, 2003.
3. Rajendra Akerkar and Rupali Akerkar, Discrete Mathematics, Pearson Education, 2004

B.Sc.(CS) 2.7-DSC-1B(Pr): PROBABILITY & STATISTICS LAB

Programs:

1. Program to construct a discrete frequency distribution table and find mean and standard deviation.

2. Program to construct a continuous frequency distribution table for given data and find mean and standard deviation.

3. Program to find the mean, mode and median of continuous frequency distribution.

4. Program to find Karl Pearson correlation coefficient between two variables.

5. Program to find the rank correlation, coefficient between two variables.

6. Program to fit the regression equation X on Y and Y on X.

7. Program to fit Binomial distribution.

8. Program to fit straight line equation and obtain trend value.

9. Program to fit Poisson distribution.

10. Program to find AM, GM, HM for given set of observation.

11. Program to calculate GM for tabulated data.

12. Program to calculate combined AM and find HM for continuous set of data

13. Program to calculate combined SD.

14. Program to calculate median for raw set of data.

15. Program to find median for tabulated data.

Note: All programs should be carried out on UNIX/LINUX platform

B.Sc.(CS)-2.8-DSC-2B(Pr): OOP with C++ LAB

Programs:

1. Demonstrate digital clock
2. Calculate area and circumference of a circle using inline function
3. Demonstrate default arguments function.
4. Demonstrate object as function arguments and returning objects from function.
5. Input roll number, name, marks of three subjects and display total and average demonstrating array as object.
6. Swap two numbers using friend function.
7. Demonstrate single inheritance.
8. Demonstrate multiple inheritances.
9. Perform addition of 2 matrices using operator overloading.
10. Demonstrate multiplication of two matrices using operator overloading.
11. Demonstrate to overload Arithmetic Assignment "+=" and "-=" operators
12. Implement operations on stack.
13. Demonstrate derived class constructor and overriding member functions in base and derived class.
14. Sort elements using function template.
15. Demonstrate class template.
16. Demonstrate default constructor and parameterized constructor.
17. Demonstrate copy constructor.
18. Find area and circumference of rectangle and triangle using function overloading.
19. Compare two strings using equal operator.
20. Demonstrate virtual function.

Note: All programs should be carried out on UNIX/LINUX platform

SEMESTER - III

B.Sc.(CS)-3.1-AECC-7: ENGLISH-3

(English – Syllabus is decided by respective BoS)

B.Sc.(CS) 3.2-AECC-8: MIL-3

(MIL – Syllabus is decided by respective BoS)

B.Sc.(CS) 3.3-DSC-1C: DATA STRUCTURES USING 'C'

Total: 48 Hrs

UNIT 1:
Introduction to Data structures: Review of Structures and Pointers, Definition, Classification of Data structures: Primitive and Non-Primitive, Operations on Data structures. **Recursion:** Definition, Recursion in C, writing Recursive programs-Fibonacci, GCD, Factorial. **(8 Hrs)**

UNIT 2:
Stack: Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from infix to postfix, Applications of stacks.
Queue: Definition, Array representation of queue, Types of Queue: Simple Queue, Circular Queue, Double Ended Queue (dequeue), Priority Queue, Operations on all types of Queues **(10 Hrs)**

UNIT 3:
Linked list-Definition: Components of linked list, representation of linked list, Advantages and disadvantages linked list. Types of linked list: singly and doubly, circular and circular doubly linked list. Operations on singly linked list: creation, insertion, deletion, search and display. **(9 Hrs)**

UNIT 4:
Tree-Definition: Tree, Binary tree, Complete Binary tree, Binary search tree, Heap. Tree terminology: Root, Node, Degree of a node of a tree, Terminal nodes, on-terminal nodes, siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Travel of Binary tree: Pre order, In order and Post order.
(9 Hrs)

UNIT 5:
Searching and Sorting: Searching algorithm techniques: Sequential search, Binary search-Iterative and Recursive methods, Comparison between Sequential and binary Search**.**
Sorting: General Background**:** Definition, different types: Bubble sort, Merge sort, Quick sort.

(12 Hrs)

Text Books:

1. Kamthane: Introduction to Data Structure in C. Pearson Education 2005.
2. Langsam, Ausenstein Maoshe & M. Tanenbaum Aaron, Data Structure using C and C++ Pearson Education.

References Books:

1. Weiss, Data Structure and Algorithm Analysis in C, 2nd Edition, Pearson Education.
2. Lipschutz: Schaum's outline series Data Structures, Tata McGraw Hill.

B.Sc.(CS) 3.4-DSC-2C: MICROPROCESSOR 8085

Total 48 Hrs

UNIT 1:
Introduction of Microprocessor & Interfacing Devices: Introduction to Microprocessor, Evolutions of Microprocessor, Microprocessor based Systems, Microprocessor Instruction Sets & Various Computer Languages.
Microprocessor Architecture: Features of 8085 Microprocessor, PIN Diagram of 8085 Microprocessor, Address Bus & Multiplexed Address / Data Bus Control and status signals, Power-supply and clock frequency, Externally initiated signals including Interrupts Serial I/O Ports, Block Diagram of 8085 Microprocessor, 8085 Programming Model, 8085 BUS organization and 8085 registers, Microprocessor Operations: Microprocessor initiated Operations, Internal data operations, Externally Initiated operations, Microprocessor Communication & Bus Timings, De-multiplexing the Bus AD7 to AD0, Generating Control Signals, 8085 Machine Cycles & Bus Timings, Opcode Fetch Machine Cycle, Memory Read Machine Cycle Example of an 8085 – based microcomputer.

(12 Hrs)

UNIT 2:
Memory & I/O Interfacing: Memory Classifications, Flip-Flop or Latch as a storage Element, Memory Map and Addresses Memory Instruction, Fetch Memory Interfacing: Memory Structure & it's Requirements Basic Concepts in Memory Interfacing, Interfacing

Circuits, Address Decoding & Memory Addresses, Input & Output Devices: I/Os With 8-Bit Addresses. I/Os With 16-Bit Addresses, Logic Devices for Interfacing, Tri-State Devices, Buffer Encoders & Decoders, Interfacing of I/O Devices: Basic Interfacing Concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O Comparison of Memory Mapped I/O & Peripheral I/O.

(10 Hrs)

UNIT 3:

Instruction Set & Programming Techniques Instruction Formats: Single Byte, Two Bytes & Three Bytes Instructions, Opcode Format Instruction, Timings & Operation Status, DATA Transfer Operations, Arithmetic Operations, Logic Operations, Branch Operations, Stack, I/O& Machine Control Instructions, Looping, Counting and Indexing Counter and Timing delays, Stack and Subroutines Code conversion, BCD Arithmetic operations and 16 Bit data operations, How to write an assemble language program & Execute a simple program.

(10 Hrs)

UNIT 4:

Programmable Interface Devices: 8155 I/O & Timer, IC & Programming of 8155, 8255 Programmable Peripheral Interface & Programming of 8255, 8259 Programmable Interrupt Controller, 8279 Display and keyboard controller.

(8 Hrs)

UNIT 5:

Advance Microprocessor: 8086 General Idea of Architectural Advancements of Microprocessors: Pipelining, Cache memory, Memory Management, Virtual Memory System, Features of 8086 Microprocessor, Register Organization of 8086: General Data Registers Segment, Registers Pointer and Index Registers, Flag Register, Internal Organization of 8086, Bus Interface Unit (BUI), Execution Unit (EU), Memory Segmentation, Flag register and description of all flag bits, Interrupts.

(8 Hrs)

Text Books:

1. Ramesh Gaonkar, Microprocessor Architecture, Programming, and application with 8085,Penram International Publication, 2011.
2. K. R. Venugopal & Rajkumar, Microprocessor x86 programming, BPB Publication, 2007.

Reference Books:

1. John Ufferbeck, The 8080/85 Family: Design, Programming & Interfacing, PHI India.
2. A. K. Ray & K. M. Bhurchandani, Advance Microprocessor and Peripherals, 2nd Edition, Tata McGraw Hill, 2006.

B.Sc.(CS) 3.5-DSC-3C: FUNDAMENTALS OF DIGITAL ELECTRONICS

Total: 48 Hrs

UNIT 1:
Number system and codes: Binary number system, decimal number system, octal number system, hexadecimal number system. Bases inter conversions. Representation of negative numbers 1's and 2's complements. Codes: BCD, GRAY, EXCESS-3.

(4 Hrs)

UNIT 2:
Boolean algebra and logic systems: Laws of Boolean algebra, Boolean laws. Evaluation of Boolean expression, De Morgan's theorems and proof, simplification on Boolean expressions using Boolean laws Basic gates (AND, OR, NOT): truth table, Definition, Boolean expression and symbols, universal gates (NAND, NOR): truth table, definition, Boolean expression and symbols, design of basic gates using NAND and NOR gates. Logical gates using NAND and NOR, Design of given Boolean expression using basic gates or NAND gate or NOR gate. XOR and XNOR gate (Definition, Boolean expression and symbols, truth table).

(10 Hrs)

UNIT 3:
Simplification of Boolean functions: SOP and POS form, min term and max term, expression of Boolean equation in Min and Max term (conversion of SOP and POS forms to standard form) K-map method: Rules, simplification of Boolean equation using K-map (up to 4 variables), without and with don't-care condition, Implementation using basic gates or NAND gate or NOR gate, Quine - Mc Cluskey Tabulation method, determination and selection of prime implicates.

(12 Hrs)

UNIT 4:
Combination logic: Design procedure, design of half adder and full adder, half subtract or and full sub tractor. Code converters:- BCD to Excess 3 code, gray code, magnitude comparator, encoders (BCD to decimal), decoder (decimal to BCD), multiplexer(4:1 and 8:1), de-multiplexer(1:4 and 1:8).

(8 Hrs)

UNIT 5:
Sequential logic: Introduction, Flip-flops – SR,JK, D, T, JK-MS (Detailed Study) Registers – Introduction, shift register- types and applications. Counters – synchronous and asynchronous counters (Up, down, up down).

(14 Hrs)

Text Books:

1. M. Moris Mano, Computer System Architecture, 2nd Edition, Prentice Hall of India.

Reference Books:

1. Heuring and Jordan, Computer systems design and architecture, Pearson Education

2. William Stallings, Computer Organization and Architecture, Pearson Education 2003.

3. Andrew S Tenenbaum, Structured Computer Organization, 3rd Edition, Prentice Hall of India(1990).

B.Sc.(CS) 3.6-DSC-4C: DATA COMMUNICATION

Total: 48 Hrs

UNIT 1:
Introduction: Data Communication: Components, Representation, Data flow. Networks: Network Criteria, Network Topology, Physical structure, Network Classification, The Internet, Protocols and Standards, Switching: Message, Packet and Circuit switching.
Network Models: Layered architecture, The OSI model, TCP/IP Protocol suite, ARPANET.
(8 Hrs)

UNIT 2:
Digital transmission and physical layer: Digital Representation of Information, Analog and Digital signals, Data rate limits, Digital to Analog conversion, Analog to digital conversion, **Digital transmission:** Line coding, Modulation, Transmission modes, **Multiplexing:** Frequency Division Multiplexing (FDM), Time Division Multiplexing(TDM), Wavelength Division Multiplexing(WDM). SONET**,** ISDN
Transmission Media: Guided media: Twisted Pair, Co-axial Cable, Optical fiber, Un-guided media. Cellular Telephones Generation of networks: 1G,2G,3G,4G.
(12 Hrs)

UNIT 3:
Datalink Layer: Datalink Layer Design Issues**, ARQ Protocols**: Stop and Wait, GO – Back - N, Selective Repeat Protocols. Efficiency of ARQ Protocols, Flow control, Sliding window flow control. Data link control: HDLC, PPP. Statistical Multiplexing, Error detection, Parity bit, Two-dimensional parity checks, Internal checksum, Polynomial codes.
(10 Hrs)

UNIT 4:
Medium access Control Protocols: Multiple access communication, Local Area Network- LAN Structure, MAC Sublayer, Logical link control layer, Random Access Protocol- ALOHA, Slotted ALOHA, CSMA, CSMA/CD. Scheduling Approaches to medium access control- Reservation Systems, Polling, Token Passing ring, Channelization-FDMA, TDMA, CDMA.

(10 Hrs)

UNIT 5:
LAN Standards- Ethernet and IEEE 802.3 LAN Standard, Token Ring and IEEE 802.5 LAN Standard, FDDI, Wireless LAN's and IEEE 802.11 LAN Standard. **Connecting LAN's:** Connecting Devices- Hubs, Repeaters, **Bridges:** Transparent Bridges, Source Routing Bridge, Mixed-media Bridge, Routers, Gateways, Backbone Networks, Virtual LAN's**.** **(8 Hrs)**

Text Books:

1. Alberto Leon-Garcia & Indra Widjaja, Communication Networks- Fundamental Concepts & Key Architecture, Mc.Graw Hill.
2. Behrouz Ferouzan, introduction to Data Communications & Networking TMH.
3. Stalling, Data and Computer Communications, 7/e, Pearson Education.

References Books:

1. Andrew S Tanenbaum Computer Networks, 4/e, Pearson Education.
2. S. Keshav, An Engineering Approach to Computer Networks. Pearson Education.

B.Sc.(CS) 3.7-DSC-1C(Pr): DATA STRUCTURES USING 'C' LAB

Programs:

1. Write a C program to read and Calculate item prices used in party and divide the expenses amount in friends equally in C using Structures.
2. Write a C program to calculate the length of the string using pointer.
3. Write a C program to simulate the working of Tower of Hanoi problem for N disks, print the total number of moves taken by the program.
4. Write a C program to create a file for N number of Employees; it should contain Emp. No., Name of the Employee, Basic Salary, DA, Total Salary.
5. Write a C program to demonstrate the working of stack of size N using an array. The operations to be supported are 1. PUSH 2. POP 3. DISPLAY.
6. Write a C program to convert an Infix Notation to Postfix Notation.
7. Write a C program to convert and Infix Notation to Prefix Notation.
8. Write a C program to simulate the working of an ordinary Queue using an array. Provide operations QINSERT, QDELETE and QDISPLAY.
9. Write a C program to implement Double Ended Queue using Array data structure.
10. Write a C program to implement Circular Queue
11. Write a C program to implement Priority Queue
12. Write a C Program to Create and display Singly Linked List.
13. Write a C program to sort a given linked list by bubble sort.
14. Write a C program to implement Dubbly Linked List.
15. Write a C program to implement Sequential Search Technique using static array & pointers.
16. Write a C program to implement Binary Search Technique using dynamic array.
17. Write a C Program to sort a list of N elements using Merge sort technique.
18. Write a C Program to sort a list of N elements using Quick sort technique.
19. Write a C Program to Tree Traversal: In-order, Pre-order, Post-order.
20. Write a C Program to Create Binary Tree.

Note: All programs should be carried out on UNIX/LINUX platform

B.Sc.(CS)-3.8-DSC-2C(Pr): MICROPROCESSOR LAB

Programs:

1. Program 1: 8- bit Subtraction

2. Program 2: 8- bit Division

3. Program 3: Palindrome

4. Program 4: Ascending order

5. Program 5: Descending order

6. Program 6: 16- bit Addition

7. Program 7: BCD to binary conversion

8. Program 8: Binary to BCD conversion

9. Program 9: Addition of a series of numbers

10. Program 10: 8- bit Multiplication

11. Program 11: Largest number in a list

12. Program 12: Stepper Motor

13. Program 13: Traffic Light

14. Program 14: LCD

15. Program 15: 7 Segment display

16. Program 16: Generation of Waveforms

Note: All the programs should execute on Simulators

SEMESTER - IV

B.Sc.(CS) 4.1-AECC-9: English-4

(English – Syllabus is decided by respective BoS)

B.Sc.(CS) 4.2-AECC-10: MIL-4

(MIL – Syllabus is decided by respective BoS)

B.Sc.(CS) 4.3-DSC-1D: DATA BASE MANAGEMENT SYSTEM

Total: 48 Hrs

UNIT 1:
Introduction: Database and Database Users, Characteristics of the Database   Approach, Different People behind DBMS, Implication of Database Approach, Advantages of Using DBMS, When not to use a DBMS.
Database System concepts and Architecture: Data Models, Schemas and Instances, DBMS Architecture and Data Independence, Data Base Languages and interfaces, The Database System environment, Classifications of Database Management Systems.

(10 Hrs)

UNIT 2:
Data Modeling Using The Entity Relation Model: High Level Conceptual Data Models for Database Design With an Example, Entity Types Entity sets, Attributes, and Keys, ER-Model Concepts, Notations fro ER Diagrams, Proper Naming of Constructs, Relationships Types of Degree than two. Designing example ER diagrams for requirements

(8 Hrs)

UNIT 3:
Relational Data Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schema, Defining Relations, Update Operations on Relations and constraint violations, Basic Relational Algebra Operations, Additional Relational Operations. Queries in relational algebra using all the operations

(12 Hrs)

UNIT 4:
Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on primary Keys, General Definitions of Second And Third Normal Forms, Boyce-Codd Normal Form.

(6 Hrs)

UNIT 5:
Relational Database Language: Data definition in SQL-Queries in SQL, INSERT, DELETE, UPDATE Statements SQL, **Data Types in SQL:** Number Types, Character Type, NSL Character Types. **Components of SQL:** Data Definition Language (DDL), Data Manipulation Language (DML), Query Language (QL), Data Control Language (DCL), **Set**

Operations: Union, Intersection, Minus, Renaming of Tables. **SQL Operations:** Logical Operators (NOT IN, ALL, ANY, EXIST, NOT EXIST, LIKE, NOT LIKE, IS NULL, IS NOT NULL, AND, OR, NOT) **SQL Functions:** Number Functions, Character Functions, Date Functions, Aggregate Functions, **Integrity Constraints:** Advantages of Integrity Constraints, Primary Key, Unique Key, Super Key, Candidate Key, Composite Key, Foreign Key, Domain Constraint, Key Constraints VIEWS in SQL, Specifying general Constraints and assertions.

(12Hrs)

Text Books:

1. Elmasri & Navathe, Fundamentals of Database System (4ed), Pearson Education, 2003.
2. Sundarraman, Oracle 9i Programming a Primer,(1ed), Pearson Education.

Reference Books:

1. Kahate, Introductions to Database Management Systems, Pearson Education, 2004.
2. Abrahamsi silberschatag, Henry. F.Korth, S. Sudarshan, Database Systems Concepts, McGraw Hill.
3. Jefry. D. Ullaman, Principles of Database System. Oracle Press: ORACLE-Complete Reference.
4. C.J.Date, Introductins to Database Systems, (6ed) Addison Wesley, 1995.
5. Raghu Ram Krishnan, Database Management Systems, Second Edition, Mc.Graw Hill.2000.

B.Sc.(CS) 4.4-DSC-2D: CORE JAVA

Total: 48 Hrs

UNIT 1:
Introduction to JAVA: JAVA Evolution: Java History, Java Features, How Java differs from C and C++, Java and Internet, Java and World Wide Web, Web browsers, Hardware and software requirements, Java Support Systems, Java Environment. **Overview of JAVA Language:** Introduction, Simple Java Program, More of Java, An Application with Two Classes, Java Program Structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style. **Constants, Variables, and Data Types:** Introduction, Constants, Variables, Data Types, Declaration of Variables, Giving Values to Variables, Scope of Variables, Symbolic Constants, Type Casting, Getting Values of Variables, Standard Default Values. **Operators and Expressions:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Procedure of Arithmetic Operators, Type Conversion and Associativity, Mathematical functions. **Decision Making and Branching:** Introduction, Decision Making with if statement, simple if

statement, if...else statement, Nesting of if....else statements, the else if Ladder, the switch statement, the **?:** Operator. **Decision Making and Looping:** The while statement, The do statement, The for statement, Jumps in Loops, Labelled Loops.

(10 Hrs)

UNIT 2:

Classes, Arrays, Strings and Vectors: Classes, Objects and Methods: Introduction, Defining a class, Adding Variables, Adding Methods, Creating Objects, Accessing class members, Constructors, Methods Overloading, Static Members, Nesting of Methods. **Inheritance:** Extending a class, Overriding Methods, Final Variables and Methods, Finalizer Methods, Abstract Methods and Classes, Visibility Control. **Arrays, Strings and Vectors:** Arrays, One-dimensional Arrays, Creating an array, Two-dimensional Arrays, Strings, Vectors and Wrapper Classes. **(8 Hrs)**

UNIT 3:

Interfaces, Packages, and Multithreaded Programming: Interfaces: Multiple Inheritances: Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables. **Packages:** Putting Classes together: Introduction, Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes. **Multithreaded Programming:** Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a thread, Life Cycle of a thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface.

(10 Hrs)

UNIT 4:

Managing Exceptions, Applet Programming: Managing Errors and Exception: Introduction, Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging. **Applet Programming:** Introduction, How Applets Differ from Applications, Preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, More about Applet Tag, Passing Parameters to Applets, Aligning the Display, More About HTML Tags, Displaying Numerical Values, Getting Input from the user. **(12 Hrs)**

UNIT 5:

Graphics Programming, Input/Output: Graphics Programming: Introduction, The Graphics class, Lines and rectangles, circles and ellipses, Drawing Arcs, Drawing Polygons, Line Graphs, Using Control Loops in Applets, Drawing Bar Charts.

(8 Hrs)

Text Books:

1. Shishir Gundavaram, CGI Programming on the World Wide Web, O'Reilly and Associates, (1996). (Chapter 1-7)
2. E. Balaguruswamy, Programming with JAVA, A Primer, 2nd Edition. TMH (1999), (Chapter 2-16)

Reference Books:

1. Thomas Boutel, CGI Programming in C and Perl, Addison—Wesley, (1996).
2. Jefry Dwight et al, Using CGI, (Second Edition), Prentice Hall, India, (1997).
3. Darrel Ince & Adam Freeman, Programming the Internet with Java, Addison—Wesley,(1997).
4. Ken Arnold & James Gosling, The Java Programming Language, Addison—Wesley,(1998).
5. Patrick Naughton & Herbert Schildt, JAVA 2: The Complete Reference, 3rd Edition, TMH, (1999).

B.Sc.(CS) 4.5-DSC-3D: OPERATION REASERCH

Total: 48 Hours

UNIT 1:
Linear Programming Problems: Origin and development of operations Research, Liner programming Problem-formulation of Linear Programming problem, Graphical solution, Theory of simplex method, Use of artificial variables and their solution, Duality theory and Sensitivity Analysis.

(12 Hrs)

UNIT 2:
Transportation Problem: Mathematical formulation of transportation problem, Initial Basic Feasible solution, North West corner rule, Matrix minima method, Vogal approximation method, for balanced Transportation Problem only.

(10 Hrs)

UNIT 3:
Assignment Problem: Mathematical formulation of on Assignment Problem, Assignment algorithm and simple illustrations.

(8 Hrs)

UNIT 4:
Network Analysis: Basic components of Network, Rules of drawing Network diagram, Time calculation in Networks, Critical Path Method and Project Evaluation and Review Techniques, Algorithm and flow chart for CPM & PERT.

(10 Hrs)

UNIT 5:
Theory of Games: Two-Person Zero – sum Games, The Maximin and Minmax principle, Saddle point and values of the Game, Game without Saddle points, Mixed stratergies, Solution for 2x2games,Graphical method Dominance property, Linear programming method and their solutions.

(8 Hrs)

Text Books:

1. Taha : Operaations Reserch,7/e.Pearson Education
2. Hamady A. Taha Operations Research,Collin Mac Millan 1982.
3. Kani Swarup, P.K. Gupta and Man Mohan Operation Researcch,Sultan Chand and Sons,4793/23,Darya Ganj,New Delhi-110 002

Reference Books :

1. Billey E.Gillett, Introduction to Operations Research, Himalyal Publishing House, Delhi 1979
2. Frederick S. Hiller, Gaxald J. Deibermann, OperationResearcch, Holden Day Inc. 1974
3. Narag. A.S., Linear Programming and Decision Making, Sultan Chand and Sons.

B.Sc.(CS) 4.6-DSC-4D: SOFTWARE ENGINEERING

Total: 48 Hrs

UNIT 1:
Introduction: The Evolving role of Software, Software: Software Characteristics, Software Components, Software Applications. **The Process**: Layered Technology. Process, Methods, Tools. The Software Process, Software Process Model: Linear Sequential Model, Prototyping Model, RAD Model, Incremental Model, Spiral Model.

(8 Hrs)

UNIT 2:
Analysis Concepts and Principles: Requirements Analysis, Communication Techniques, Analysis Principles, Software Prototyping, Specification principles, Software requirements Specification. Analysis Modeling: Brief History, Elements of the Analysis Model, Data Modeling, Function Modeling and Information Flow, Behavioral Modeling, Data Dictionary.

(11 Hrs)

UNIT 3:

Design Concepts and Principles: Software Design and Software Engineering, Design Process, Design Principles, Design Concepts, Effective Modular Design: Cohesion, Coupling. Design Documentation. Software Quality Assurance: Quality Concepts, Software Quality Assurance, Software Reviews, Software Reliability.

(11 Hrs)

UNIT 4:

Software Testing Techniques and Strategies: Software Testing Fundamentals: Testing Objectives, Testing Principles, Testability, Test Case Design, white Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing, Strategic Approach to Software Testing, unit Testing, Integration Testing, Validation Testing, System Testing.

(10 Hrs)

UNIT 5:

Object Oriented Concepts and Principles: The Object Oriented Paradigm, Object Oriented Concepts, Object Oriented Analysis Introduction, Object Oriented Design: Design for Object-Oriented System, The OOD Landscape, Generic Components, The Object Oriented Process.

(8 Hrs)

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Text Books:

1. Roger Pressman, Software Engineering- a Practitioner's Approach.

Reference Books:

1. Ian Sommerville, Software Engineering, 6th Edition, Pearson, Publication Ltd.
2. Carlo Ghejgietal, Fundamentals of Software Engineering Pearson Education.

B.Sc.(CS) 4.7-DSC-1D(Pr): DATA BASE MANAGEMENT SYSTEM LAB

Programs:

1. A) Create the following relation for the student :

   Student (<u>regno </u>: string , name : string, class :string, bdate: date, marks1:int, marks1:int, marks2:int, marks3:int)

   i.   Enter atleast five tuples of the above relation
   ii.   Demonstrate the usage of following clauses for the above relation
           a. Where   c. Having
           b. Order By   d. Group By
   iii.   Demonstrate the usage of following clauses for the above relation
           a. Sum   c. Count   e. Between
           b. Avg   d. Like   f. Max & Min
   iv.   Demonstrate the rollback and commit command for the above relation

   B) Consider the following database that maintain information about employees & Departments.

   Employee(<u>empid</u>: int, ename:string, age:int, salary:int, #deptno:int)
   Department(<u>deptno:</u>int, dname: string, #manager-id: int)

   i.   Create the above tables by properly specifying the primary keys & foreign keys.
   ii.   Enter at least 5 tuples for each relation.
   iii. Display emp-id & emp name whose salary lies between 10,000 and 50,000.
   iv.   List empname & salary for all the employee working for CS Dept.
   v.   Display empname & deptname for all the managers.

2. Consider the following schema for OrderDatabase:
   SALESMAN (<u>Salesman_id</u>, Name, City, Commission)

   CUSTOMER (<u>Customer_id</u>, Cust_Name, City, Grade,Salesman_id)

   ORDERS (<u>Ord_No</u>, Purchase_Amt, Ord_Date, #Customer_id, Salesman_id)

    Write SQL queries to

   i.   Count the customers with grades above Bangalore's average.
   ii. Find the name and numbers of all salesmen who had more than one customer.
   iii. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
   iv. Create a view that finds the salesman who has the customer with the highest order of a day.
   v.   Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

3. Consider the Insurances database given below. The primary keys are underlined   and the data types are specified.

       PERSON (<u>DRIVER-ID#</u>: string, name: string, address: string)
       CAR (<u>Regno</u>: string, model: string, year: int)
       ACCIDENT (<u>report-number</u>: int, date: date, location: string)
       OWNS (#driver-id: string, #Regno: string)
       PARTICIPATED (#driver-id: string, #Regno: string, #report-number: int,
                   Damage amount: int)

   i. Create the above tables by property specifying the primary keys and the foreign keys.
   ii. Enter atleast five tables for each relation.
   iii. Demonstrate how you
      a. Update the damage amount for the car with a specific Regno in the accident with report number 12 to 25000.
      b. Add a new accident to the database.
   iv. Find the total number of people who owned cars that were involved in accidents in 2002.
   v. Find the total number of accidents in which cars belonging to a specific model were involved

4. The following tables are maintained by a book dealer.

       AUTHOR (<u>author-id</u>: int, name: string, city: string, country: string)
       PUBLISHER (<u>publisher-id</u>: int, name: string, city: string, country: string)
       CATALOG (<u>book-id</u>: int, title: string, author-id#: int, publisher-id#: int,
              category-id#: int, year: int, price: int)
       CATEGORY (<u>category-id</u>: int, description: string)
       ORDER-DETAILS (<u>order-no</u>: int, #book-id: int, quantity: int)

   i. Create the above tables by properly specifying the primary keys and the foreign keys.
   ii. Enter at least five tuples for each relation.
   iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog.
   iv. Find the author of the book, which has maximum sales.
   v. Demonstrate how you increase the price of books published by a specific publisher by 10%.

5. Consider the following database of student enrolment in courses and books adopted each course.

       STUDENT (<u>regno</u>: string, name: string, major: string, bdate: date)
       COURSE (<u>course</u>: int, cname: string, dept: string)
       ENROLL (#regno: string, course#: int, <u>sem</u>: int marks: int)
       TEXT (<u>book-ISBN</u>: int, book-title: string, publisher: string, author: string)

BOOK_ADOPTION (course#: int, sem: int, book-ISBN#: int)

     i. Create the above tables by properly specifying the primary keys and the foreign Keys.
    ii. Enter at least five tuples for each relation.
    iii. Demonstrate how you add a textbook to the database and make this book be adapted by some department.
    iv. Produce list of textbooks (include Course#, Book-ISBN, Book-title) in the alphabetical order for courses offered by the CS department that use more than two books.
    v. List any department that has its adopted books published by a specific publisher.

6. Consider the following database for library management system

    BOOK (Book_id, Title, Publisher_Name, Pub_Year)

    BOOK_AUTHORS (#Book_id, Author_Name)

    PUBLISHER (Name, Address, Phone)

    BOOK_COPIES (#Book_id, #Branch_id, No-of_Copies)

    BOOK_LENDING (#Book_id, #Branch_id, Card_No, Date_Out, Due_Date)

    LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

    Write SQL queries to

    i. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.
    ii. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun2017
    iii. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
    iv. Create a view of all books and its number of copies that are currently available in the Library.

7. Consider the schema for Company Database:

    EMPLOYEE (SSN, Name, Address, Sex, Salary, #SuperSSN, DNo)
    DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
    DLOCATION (#DNo,DLoc)
    PROJECT (PNo, PName, PLocation, #DNo) WORKS_ON (#SSN,# PNo, Hours)
    Write SQL queries to
    i. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.

ii. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percentraise.

iii. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department

iv. Create a view with columns dept name and dept location. Display name of dept located in 'Dharwad' on this view.

Note: 1. All the experiments are to be carried out using MySql
2. Draw ER diagram and Schema diagram for each lab program.

B.Sc.(CS) 4.8-DSC-2D(Pr): CORE JAVA LAB

Programs:

1. Display fibonacci series up to n terms using command line arguments.

2. Demonstrate single inheritance.

3. Sort n elements using an array.

4. Implement constructor overloading by passing different number of parameter of different types.

5. Demonstrate string methods.

6. Demonstrate vector methods.

7. Demonstrate concept of interface.

8. Demonstrate concept of creating, accessing and using a package.

9. Demonstrate multithreaded programming.

10. Demonstrate thread priority.

11. Create an applet to draw a human face.

12. Demonstrate simple banner applet.

13. Program to count number of strings, integers and float values through command line arguments.

14. Program to accept a message from the keyboard and display the no. of words and non alphabetical characters.

15. Demonstrate creation of list using an applet.

16. Demonstrate concept of event handling.

17. Program to demonstrate different types of fonts.

18. Create an applet to tokenize the string.

19. Design a simple calculator using java applets.

20. Implement static and dynamic stack using interface using abstract class.

SEMESTER - V

B.Sc.(CS) 5.1-DSC-1E: WEB TECHNOLOGIES

Total: 48 Hours

UNIT 1:
Introduction: Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, **Introduction to CSS**: What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

(8 Hrs)

UNIT 2:
HTML Tables and Forms: Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, **Advanced CSS:** Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

(10 Hrs)

UNIT 3:
JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions

(10 Hrs)

UNIT 4:
PHP Arrays and Superglobals: Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

(10 Hrs)

UNIT 5:
Managing State: The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.

(10 Hrs)

Text Books:

1. Randy Connolly, Ricardo Hoar, **"Fundamentals of Web Development",** 1stEdition, Pearson Education India.

Reference Books:

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4thEdition, O'Reilly Publications, 2015. (ISBN:978-9352130153).
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition.Pearson Education, 2016. (ISBN:978-9332582736).
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088).
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st
5. Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014 (ISBN:978-9351108078)

B.Sc.(CS) 5.6-DSC-1E(Pr): WEB DESIGNING LAB

Programs:

1. A. Create a webpage that prints your name on the screen. (HTML)
   B. Create a webpage and set its title to "This is a webpage". (HTML)
2. Print the numbers 1 - 10, each number being a different color. (HTML)
3. Print a paragraph that is a description of a book, include the title of the book as well as its author. Names and titles should be underlined, adjectives should be italicized and bolded. (HTML)
4. Print the squares of the numbers 1 - 20. Each number should be on a separate line, next to it the number 2 superscripted, an equal sign and the result. (Example: 10^2= 100) (HTML)
5. Create links to five different pages on five different websites that should all open in a new window. (HTML)
6. A. Setting a background image for a page Using CSS
   B. Setting text color and background color Using CSS
7. Setting the font type of text Setting the font size of text Setting the font color of text Setting the font style of text Using CSS
8. Create a webpage with two images which alternately changes on mouse over using CSS.
9. Write a JavaScript program to display the current day and time in the following format. Go to the editor

Sample Output : Today is : Tuesday.

Current time is : 10 PM : 30 : 38

10. Write a JavaScript program to convert temperatures to and from Celsius, Fahrenheit.

11. Write a JavaScript program to find the largest of three given integers.

12. Create a webpage with two textboxes and command buttons to perform arithmetic operations and display the result in appropriate dialog boxes using JavaScript.

13. Write a Java Script program to read the details of a student and store the same on to the MS Access database.

14. A. Write a program to count 5 to 15 using PHP loop

    B. Write a factorial program using for loop in PHP

15. Write a program to create Chess board in PHP using for loop

16. Write a program to upload and display an image using PHP.

17. Conditions: You can use html table having width="400px" and take "30px" as cell height and width for check boxes.

18. Write a simple calculator program in PHP using switch case

19. Write a program to calculate Electricity bill in PHP

20. Write a PHP program to find the length of the string and count the words in the string

B.Sc.(CS)E 5.2A-DSE-1E: Elective-1: MANAGEMENT INFORMATION SYSTEM

Total: 48 Hours

UNIT 1:
Management Information Systems: Management Information System: Concept, MIS: Definition, Role of the Management Information System, impact of the Management Information System, Management Information, System and computer, Management Information System and academics, MIS and the user.
Role and Importance of Management: Introduction to Management, Approaches to Management, Functions of the Manager, Managers and the Environment, Management as a Control System, Management by Exception, **MIS:** A support to the Management.

(10 Hrs)

UNIT 2:
Process Management: Management Effectiveness, planning, Organising, Staffing, Coordinating and directing, Controlling, **MIS:** A Tool for Management Process.
Organization Structure and Theory: Basic Model of Organization Structure, Modifications to the Basic Model of Organization Structure, Organization Behavior, Organization as a System, MIS: Organization.

(15 Hrs)

UNIT 3:
Strategic Management of Business: The Concept of Corporate Planning, Essentially of Strategic, Planning, Development of the Business Strategies, Types of Strategies, Short-range Planning, Tools of Planning, MIS: Business Planning.
Decision Making: Decision Making Concepts, Decision Methods, Tools and Procedures, Behavioral Concepts in Decision Making, Organizational Decision Making Concepts, MIS and Decision Making concepts.

(13 Hrs)

UNIT 4:
Development of MIS: Development of Long Range Plans of the MIS, Ascertaining. The Class of Information of the MIS, Management of Quality in the MIS, Organization for Development of the MIS, MIS: The Factors of Success and Failure.

(6 Hrs)

UNIT 5:
Decision Support System: Decision Support System (DSS): Concept and Philosophy, DSS: Deterministic Systems, Artificial Intelligence (AI) System, Knowledge Based Expert System (KBES), MIS and Role of DSS.

(4 Hrs)

Text Books:

1. W.S.Jawadekar, Management Information Systems, Tata McGraw-Hill.
2. Laudon and Laudon, Management Information Systems, Pearson Education, Asia.

Reference Books:

1. Devis and Olson, Management Information System, Tata McGraw-Hill.

B.Sc.(CS)E 5.2B-DSE-1E: Elective -1: MANAGERIAL ECONOMICS

Total: 48 Hours

UNIT 1:
Introduction: Meaning and definition- Managerial Economics, Salient features and significance, role of managerial economics, scope of managerial economics, uses/objectives of managerial economics, meaning of micro and macro economics, differences between micro and macro economics, importance and uses of micro economics, limitations of micro economics. **(8 Hrs)**

UNIT 2:
Demand Analysis: Meaning of demand, individual and market demand, determinants of demand, demand-function, schedule, curve, the law of demand, exceptions to the law of demand, change in quantity demand vs change in demand, reasons for change in demand, Elasticity of demand, factors influencing elasticity of demand, price elasticity of demand and types, income elasticity of demand and types, cross elasticity of demand. Demand forecasting-meaning, significance and methods. **(10 Hrs)**

UNIT 3:
Supply Analysis: Meaning of supply, determinants of supply, law of supply, extension and contraction in supply, increase and decrease in supply, causes of change in supply, elasticity of supply.

(4 Hrs)

UNIT 4:
Production Analysis and Cost Analysis: Production analysis: Concept of production function, factors of production, laws of production- the law of diminishing marginal returns, the law of variable proportions, the law of returns to scale, isoquants (only meaning), economies of scale and diseconomies of scale. Cost analysis: meaning of cost, types of cost, cost concepts-TFC, TVC, TC, AC, and MC their meaning and computation.

(14 Hrs)

UNIT 5:
Market Structures and Pricing Policies: Meaning of market, Pure and Perfect Competition & its features, Imperfect Competition & its features, Monopoly, Duopoly, Oligopoly, Monopolistic and Oligopolistic markets. Pricing policies – objective of pricing policy, factors involved in pricing policy, pricing methods- cost plus, going rate, pricing for rate of return, administered price.

(12 Hrs)

<u>**Text Books:**</u>

1. Managerial Economics, D.N. Dwivedi, Vikas publication
2. Managerial Economics - Theory and Application - D. M. Mithani

Reference Books:

1. Managerial Economics, Stephen Hill, Palgrave Macmillan
2. Managerial Economics – Analysis, Problems and Cases, P.L. Mehta, Sultan Chand Sons, New Delhi
3. Managerial Economics – Varshney and Maheshwari, Sultan Chand and Sons, New Delhi
4. Managerial Economics – D. Salvatore, McGraw Hill, New Delhi
5. Managerial Economics – Pearson and Lewis, Prentice Hall, New Delhi
6. Managerial Economics – G.S. Gupta, T M H, New Delhi

B.Sc.(CS)E 5.2C-DSE-1E: Elective-1: DECISION SUPPORT SYSTEMS

Total: 48 Hours

UNIT 1:
Decision Support Systems: An Overview: DSS Configuration, What is DSS? Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The Model Management Subsystem, User Interface Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classification.

(8 Hrs)

UNIT 2:
Decision Support Systems Development: Introduction to DSS development, The Traditional System Development Life cycle, Alternate Development Methodologies, Prototyping: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, End User-Developed DSS, Putting the System Together.

(10 Hrs)

UNIT 3:
Group Support Systems: Group Decision Making, Communication and Collaboration, Communication Support, Collaboration Support: Computer Supported Cooperative work, Group Support Systems, Group Support Systems Technologies, Group Systems Meeting Room and Online, The GSS Meeting Process, Distance Learning, Creativity and Idea Generation.

(10 Hrs)

UNIT 4:
Decision Making and Computerized Support-1: Managers and Decision Making, Managerial-Decision Making and Information Systems, Managers and Computer Support, Computerized Decision Support and the Supporting technologies, A frame work for decision support, The concept of Decision Support systems, Group Decision Support Systems, Enterprise Information Systems, Knowledge Management systems, Expert Systems, Artificial Neural Networks, Hybrid Support Systems. Decision-Making Systems, Modelling and Support: Introduction and Definitions, Systems, Models.

(10 Hrs)

UNIT 5:
Decision Making and Computerized Support-2: Phases of Decision Making Process, Decision-Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision Making: Implementation Phase, How decisions are

supported, Personality types, gender, human cognition, and decision styles; The Decision-Makers.

(10 Hrs)

Text Books:

1. Efraim Turban. Jay E. Aronson, Ting-Peng Liang: Decision Support Systems and Intelligent Systems, 8th Edition, Pearson Education, 2008. (Chapters 1, 2, 3, 6, 7, 8 excluding 8.7 to 8.9, 9, 15)

Reference Books:

1. Sprague R.H. Jr and H.J. Watson: Decision Support Systems, 4th Edition, Prentice Hall, 1996.

B.Sc.(CS)E 5.3A-DSE-2E: Elective-2: COMPUTER GRAPHICS

Total: 48 Hours

UNIT 1:
Graphics system: Introduction of Computer Graphics, Applications of CG. Video Display Devices: Cathode-Ray Tube, Raster-Scan Displays, Random-Scan Displays, Color CRT monitors, Flat-Panel Displays, Three-Dimensional viewing Devices, Raster-Scan Systems and Random-Scan Systems, Hard copy devices, input devices, Graphic software.
(8 Hrs)

UNIT 2:
Output Primitives: Points and lines, Line drawing algorithm: Digital Differential Analyzer (DDA), Bresenham's line algorithms, Circle generating algorithms. Ellipses (Example Problems), Attributes of output primitives: Line type, Line Width, Line color, Area filling, scan line algorithm**.** **(10 Hrs)**

UNIT 3:
Two dimensional transformations: Basic transformation: translation, scaling and Rotation. Matrix representation and homogeneous co-ordinates, composite transformation: translation, scaling and rotations, Other Transformations. Transformations Between Coordinate Systems, Roster methods for transformation, **Two-Dimensional Viewing and clipping:** The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-To-Viewport Coordinate Transformation. Clipping algorithms: line clipping, area clipping, Polygon clipping.
(14 Hrs)

UNIT 4:
Interactive Input Methods: Physical input devices: Keyboard, touchpanels, lightpen, Graphics tablets, joysticks, mouse, trackball, interactive picture construction techniques.
Three Dimensional concepts: Three-dimensional co-ordinate systems, three-dimensional display techniques, perspective and parallel projections, polygon surfaces, curved surfaces, Quadric Surfaces, Bazier Curves and Surfaces octrees.
(10 Hrs)

UNIT 5:
Segments: Introduction, Segment Table, Function of Segmenting the Display File, More about segments, Image Transformation, Raster Techniques, Animation using Segments.
(6 Hrs)

Text books:

1. Donald Hearn & M. Pauline Baker, Computer Graphics C Version, Pearson education/PHI.
2. Computer Graphics-Steven Harrington, McGH

Reference books:

1. Principles of Interactive Computer Graphics-Newman and Sproull, McGraw Hill
2. Graphics Under C-Yeshwant Kanetkar, BPB publications.
3. James D foley, Adries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Addison Wesley,1997.

B.Sc.(CS)E 5.3B-DSE-2E: Elective-2: COMPUTER NETWORKS

Total: 48 Hours

UNIT 1:
The Application Layer: Dns-The Domain Name System, Electronic Mail, Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web, Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP—The HyperText Transfer Protocol, The Mobile Web, Web Search, Streaming Audio And Video, Content Delivery.

(10 Hrs)

UNIT 2:
The Network Layer: Network Layer Design Issues, Routing Algorithms, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing, Routing for Mobile Hosts, Routing in Ad Hoc Networks.

(10 Hrs)

UNIT 3:
Congestion Control Algorithms: Approaches to Congestion Control, Traffic-Aware Routing, Admission Control, Traffic Throttling, Load Shedding, Quality of Service, Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control, Integrated Services, Differentiated Services, Internet working, How Networks Can Be Connected, Internetwork Routing, Packet Fragmentation.

(8 Hrs)

UNIT 4:
The Transport Layer: The Transport Service, Berkeley Sockets, An Example of Socket Programming: An Internet File Server, Elements Of Transport Protocols, Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery, Congestion Control, Desirable Bandwidth Allocation, Regulating the Sending Rate, Wireless Issues.

(10 Hrs)

UNIT 5:
The Internet Transport Protocols: UDP, Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, The Internet Transport Protocols: TCP, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, TCP Timer Management, TCP Congestion Control, Performance Issues, Performance Problems in Computer Networks, Network Performance Measurement, Host Design for Fast Networks, Fast Segment Processing, Header Compression, Protocols for Long Fat Networks, Delay-Tolerant Networking, DTN Architecture.

(10 Hrs)

Text Books:
1. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson
2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach,Sixth edition, Pearson,2017 .

Reference Books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition,McGraw Hill, Indian Edition
2. L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER
3. Mayank Dave, Computer Networks, Second edition, Cengage Learning

B.Sc.(CS)E 5.3C-DSE-2E: Elective-2: OBJECT ORIENTED ANALYSIS & DESIGN

Total: 48 Hours

UNIT 1:
Introduction: Overview of object oriented system development, Object basics, The Unified Process, Modelling concepts, Modelling as a design technique, Analysis and modelling, UML diagrams, Use case Modelling, Class Modelling, State Modelling, Interaction Modelling.

(10 Hrs)

UNIT 2:
Requirements & More Modelling: Object Constraint Language, Inception, Evolutionary Requirements, Domain Models, System Sequence Diagrams, Operation Contracts.

(8 Hrs)

UNIT 3:
Design and Principles Of Design: Requirements to Design, Design Patterns, Logical Architecture, Package diagram, Design patterns, Model, View, Control pattern, Detailed design – Object design with GRASP pattern, Detailed class diagram with Visibility.

(10 Hrs)

UNIT 4:
Mapping To Code: Mapping designs to code, Test Driven development and refactoring, UML Tools and UML as blueprint

(10 Hrs)

UNIT 5:
More Patterns: Analysis update, Objects with responsibilities, Applying design patterns, Architectural Analysis, Logical Architecture Refinement, Package Design, Persistence framework with patterns.

(10 Hrs)

Text Books:

1. Michael Blaha and James Rumbaugh, "Object-oriented modeling and design with UML", Prentice-Hall of India, 2005.
2. Craig Larman. "Applying UML and Patterns – An introduction to Object-Oriented Analysis and Design and Iterative Development", 3rd ed, Pearson Education, 2005.

Reference Books:

1. Ali Bahrami, "Object Oriented Systems Development", McGraw-Hill, 1999.
2. Booch, Grady. Object Oriented Analysis and Design. 2nd ed. Pearson Education 2000.
3. Fowler, Martin. UML Distilled. 3rd ed. Pearson Education. 2004.
4. Lunn, Ken. Software development with UML. Palgrave Macmillan. 2003.
5. O'Docherty, Mike. Object-Oriented Analysis & Design. Wiley. 2005.

B.Sc.(CS)E 5.4A-DSE-3E: Elective-3: ARTIFICIAL INTELLIGENCE

Total: 48 Hours

UNIT 1:
Introduction: What is AI? Intelligent Agents: Agents and Environment; Rationality; the Nature of Environment; the Structure of Agents. Problem solving: Problem-Solving Agents; Example Problems; Searching for Solution; Uninformed Search Strategies.

(8 Hrs)

UNIT 2:
Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed Search Strategies; Heuristic functions; On-line Search agents and Unknown environment. Constraint satisfaction problems; Backtracking search for CSPs, **Adversial search**: Games; Optimal decisions in games; Alpha-Beta pruning.

(10 Hrs)

UNIT 3:
Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic.

(10 Hrs)

UNIT 4:
First-Order Logic, Inference in First-Order Logic – 1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting.

(10 Hrs)

UNIT 5:
Inference in First-Order Logic – 2: Forward chaining; Backward chaining; Resolution.

(10 Hrs)

Text Books:

1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003.

Reference Books:

1. Elaine Rich, Kevin Knight: Artificial Intelligence, 3rd Edition, Tata McGraw Hill, 2009.
2. Nils J. Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.

B.Sc.(CS)E 5.4B-DSE-3E: Elective- 3: INTRODUCTION TO MACHINE LEARNING

Total: 48 Hours

UNIT 1:
Introduction: What Is Machine Learning? Examples of Machine Learning Applications, **Supervised Learning:** Learning a Class from Examples Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm.

(10 Hrs)

UNIT 2:
Bayesian Decision Theory: Introduction, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Value of information, Bayesian Networks, Influence Diagrams, Association Rules.

(10 Hrs)

UNIT 3:
Parametric Methods: Introduction, Maximum Likelihood Estimation, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Biasj Variance Dilemma, Model Selection Procedures.

(10 Hrs)

UNIT 4:
Multivariate Methods: Multivariate Data, Parameter Estimation, Estimation of Missing Values, Multivariate Normal Distribution, Multivariate Classification, Tuning Complexity, Discrete Features, Multivariate Regression. Dimensionality Reduction: Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis.

(10 Hrs)

UNIT 5:
Clustering: Introduction, Mixture Densities, k-Means Clustering, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

(8 Hrs)

Text Books:

1. Ethem Alpaydin, 2004, 'Introduction to machine Learning', PHI.

Reference Books:

1. Tom M Mitchell, 1996, Machine Learning McGraw Hill Publications.

B.Sc.(CS)E 5.3C-DSE-3E: Elective-3: INTERNET OF THINGS

Total: 48 Hours

UNIT 1:
Introduction : What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

(8 Hrs)

UNIT 2:
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

(10 Hrs)

UNIT 3:
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

(10 Hrs)

UNIT 4:
Data and Analytics for IoT: An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

(10 Hrs)

UNIT 5:
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.

(10 Hrs)

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
2. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

B.Sc.(CS) 5.5-SEC-1E: MINI PROJECT-I

SEMESTER -VI

B.Sc.(CS) 6.1-DSC-1F: PYTHON PROGRAMMING

Total: 48 Hours

UNIT 1:
Introduction: Installing Python, Simple program using Python, Expressions and Values, Variables and Computer. Memory, error detection, multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. **Working with Text:** Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard, A Boolean Type, Choosing Statements to Execute, Nested If Statements, remembering the Results of a Boolean Expression Evaluation.

(10 Hrs)

UNIT 2:
A Modular Approach to Program Organization: Importing Modules, Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods, Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores, **Storing Collections of Data Using Lists:** Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists.

(**10 Hrs**)

UNIT 3:
Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping, Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue. **Reading and Writing Files:** Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records.

(**10 Hrs**)

UNIT 4:
Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections. **Collection of New Information Object-Oriented Programming:** Understanding a Problem Domain, Function "Isinstance," Class Object, and Class Book, write a Method in Class Book**.**

(10 Hrs)

UNIT 5:

Plugging into Python Syntax: More Special Methods, **Creating Graphical User interface:** Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.

(8 Hrs)

Text Books:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey, Jeffrey Elkner, 2015

Reference Books:

1. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.
2. Exploring Python, Timothy A. Budd, Mc Graw Hill Education.
3. Python for Informatics: Exploring Information, C harles Severance.
4. Learning Python, Fourth Edition, Mark Lutz, O'Re illy publication

B.Sc.(CS) 6.6-DSC-1F(Pr): PYTHON PROGRAMMING LAB

Programs:

1. a. Write a python program to print "Hello Python"

   b. Write a python program to do arithmetical operations
2. Write a python program to find the area of a triangle
3. Write a python program to solve quadratic equation
4. Write a python program to swap two variables
5. Write a python program to convert Celsius to Fahrenheit
6. Write a python Program to Check if a Number is Odd or Even
7. Write a python Program to Print all Prime Numbers in an Interval
8. Write a python Program to Find the Factorial of a Number
9. Write a python Program to Display the multiplication Table
10. Write a python Program to Multiply Two Matrices
11. Write a python Program to Find LCM & GCD using functions
12. Write a python program to read a word and print the number of letters, vowels in the word.
13. Write a python program to input an array of n numbers and find separately the sum of positive numbers and negative numbers.
14. Write a python program to search an element using linear equation.
15. Write a python program to search an element using binary search
16. Write a python program to insert a number in a sorted array.
17. Write a python program to stimulate stack operation.
18. Write a python program to draw shapes & GUI controls.
19. Write a python programs to using the built-in methods of the string, list and dictionary classes.
20. Write a python program to demonstrate exception handling.

B.Sc.(CS)E 6.2A-DSE-1F: Elective-1: DATA MINING

Total: 48Hrs

UNIT 1:
Data Mining: Introduction, What is data mining, Data Mining Definitions, KDD Vs Data Mining, DBMS Vs Data Mining, Other related areas, DM techniques, Other Mining Problems, Issues and Challenges in DM, DM application areas, DM applications. Data Warehouse: Introduction, What is Data Warehouse, Definition, Multidimensional Data Model, OLAP operations, Warehouse Schema, Data Warehouse Architecture, Warehouse Server, Meta Data, Data Warehouse backend process.

(8 Hrs)

UNIT 2:
Association Rules: Introduction, Association Rule, Methods to discover association rules, a priori algorithm, partition algorithm, pincer-search algorithm(only concept p-84), Decision Trees :Introduction, Decision Tree, Tree Construction Principle, Best Split, Splitting Indices (only definitions of Entropy), Decision Tree Construction Algorithms, CART, ID3.

(10 Hrs)

UNIT 3:
Rough Set Theory: Introduction, Definition (up to -Rough Set p- 210,211), Rough Sets and Fuzzy Sets (concept, definition of rough set member function-p226), Other Techniques :Introduction, Neural Network, Learning in NN, Unsupervised Learning, Genetic Algorithm, Support Vector Machines (Concept).

(10Hrs)

UNIT 4:
Clustering Techniques: Introduction, Clustering Paradigms, Partitioning, Algorithms, k-Medoid Algorithms (PAM concept, Partitioning concepts. p-123), CLARA, Hierarchical Clustering, DBSCAN (concept Only, No definitions. p- 129), Categorical Clustering Algorithms, STIRR (concept excluding example)

(10 Hrs)

UNIT 5:
Web Mining: Introduction, Web Mining, Web Content Mining, Web Structure Mining (exclude example), Web Usage Mining, Text Mining, Unstructured Text, Episode Rule Discovery for Texts. Temporal and Spatial Advanced Data Mining: Introduction, Temporal Data Mining, Temporal Association Rules, Sequence Mining, The GSP Algorithm, Episode Discovery, Spatial Mining.

(10 Hrs)

Text Books:

1. Arun K. Pujari, Data Mining Techniques, , Universities Press India, 4th Edition 2016
2. Han, Jiawei and Kamber, Michelin, Data Mining: Concepts and Techniques. Morgan Kaufman Publishers, 2012.

Reference Books :

1. M Ramakrishna Murthy, Introduction to Data Mining and Soft Computing Techniques, Laxmi Publications Pvt Ltd, 2017.
2. Paul Teetor, R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics, O'reilly Cookbooks, 2011
3. Margaret H. Dunhan: Data mining-Introductory and Advanced Topics, Pearson Education.

B.Sc.(CS)E 6.2B-DSE-1F: Elective-1: MOBILE COMMUNICATIONS

Total: 48 Hours

UNIT 1:
Cellular Concept: Frequency Reuse, Channel Assignment Strategies, Interference and System Capacity, Power Control for Reducing Interference, Trunking and Grade of Service, Improving Capacity in Cellular Systems.
Mobile Radio Propagation: Large Scale path Loss- Free Space Model, Three basic propagation mechanisms, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models – Okumura, Hata, PCS Extension to Hata Model (explanations only).

(8 Hrs)

UNIT 2:
Mobile Radio Propagation: Small-Scale Fading and Multipath: Small scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Rayleigh and Ricean Distributions, Statistical Model for Multipath Fading Channels (Clarke's Model for Flat Fading only).

(10 Hrs)

UNIT 3:
System Architecture and Addressing: System architecture, The SIM concept, Addressing, Registers and subscriber data, Location registers (HLR and VLR) Security-related registers (AUC and EIR), Subscriber data, Network interfaces and configurations.
Air Interface – GSM Physical Layer: Logical channels, Physical channels, Synchronization- Frequency and clock synchronization, Adaptive frame synchronization, Mapping of logical onto physical channels, Radio subsystem link control, Channel coding,

source coding and speech processing, Source coding and speech processing, Channel coding, Power-up scenario.

GSM Protocols: Protocol architecture planes, Protocol architecture of the user plane, Protocol architecture of the signaling plane, Signaling at the air interface (Um), Signaling at the A and Abis interfaces, Security-related network functions, Signaling at the user interface.

(10 Hrs)

UNIT 4:

GSM Roaming Scenarios and Handover: Mobile application part interfaces, Location registration and location update, Connection establishment and termination, Handover.
Services: Classical GSM services, Popular GSM services: SMS and MMS.
Improved data services in GSM: GPRS, HSCSD and EDGE GPRS System architecture of GPRS , Services , Session management, mobility management and routing, Protocol architecture, Signaling plane, Interworking with IP networks, Air interface, Authentication and ciphering, Summary of GPRS . HSCSD: Architecture, Air interface, HSCSD resource allocation and capacity issues. EDGE: The EDGE concept, EDGE physical layer, modulation and coding, EDGE: effects on the GSM system architecture, ECSD and EGPRS.

(10 Hrs)

UNIT 5:

CDMA Technology : Introduction to CDMA, CDMA frequency bands, CDMA Network and System Architecture, CDMA Channel concept, Forward Logical Channels, Reverse logical Channels, CDMA frame format, CDMA System Operations(Initialization/Registration), Call Establishment, CDMA Call handoff, IS- 95B, CDMA2000, W-CDMA,UMTS, CDMA data networks, Evolution of CDMA to 3G, CDMA 2000 RAN Components, CDMA 2000 Packet Data Service.

(10 Hrs)

Text Books:

1. Theodore Rapport,   Wireless Communications – Principles and Practice , Prentice Hall of India, 2nd Edition, 2007, ISBN 978-8-120-32381-0.
2. Jorg Eberspacher, Hans-Jorg Vogel, Christian Bettstetter, Christian Hartmann, "GSM– Architecture, Protocols and Services , Wiley,3rd Edition, 2009,ISBN-978-0-470-03070-7.
3. Gary J Mullet,   Introduction To Wireless Telecommunications Systems and Networks", Cengage Learning.

B.Sc.(CS)E 6.2C-DSE-1F: Elective-1: DESIGN AND ANALYSIS OF ALGORITHM

Total: 48 Hours

UNIT1:
Introduction: Definition of algorithm, Characteristic of algorithm, Different Control Structures, Writing Structured Programs, Analysis of algorithm. **Divide and Conquer**: General Method, Binary Search, Finding Maximum & Minimum, Merge Sort, Quick Sort, Selection Sort, Strassen's matrix multiplication.

(15 Hrs)

UNIT 2:
Greedy Method: General Method, Knapsack Problem, Job Sequencing with Deadline, Minimum-cost Spanning trees, Optimal Storage on tapes, Optimal Merge Patterns, Single-Source Shortest Paths.

(8 Hrs)

UNIT 3:
Dynamic Programming: Introduction to Graphs, Definition types, Terms related To Graph, General Method, Multistage Graphs, All pair shortest paths, Optimal Binary Search trees, 0/1 –Knapsack, The traveling salesperson problem, Flow Shop Scheduling.

(10 Hrs)

UNIT 4:
Basic traversal & Search techniques: Search & traversal techniques for Trees, Search & traversal techniques for graphs, Code Optimization, AND/OR Graphs, Game trees.

(8 Hrs)

UNIT 5:
Backtracking: General method, The 8-Queens Problem, Sum of subsets, Graph Coloring, Hamiltonian Cycles, Knapsack Problem.

(7 Hrs)

Text Books:

1. Fundamentals of Computer Algorithm, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekarn.
2. Design & Analysis of algorithm-horowitz, Sahni

References Books:

1. The Design & Analysis of Computer Algorithms, Addison Usekey, Alfred V aho, John,E-hopcraft &

B.Sc.(CS)E 6.3A-DSE-2F: Elective-2: COMPUTER VISION

Total: 48 Hours

UNIT 1:
Introduction: Cameras**:** Pinhole Cameras, Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, and Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

(8 Hrs)

UNIT 2:
Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge Detection: Noise, Estimating Derivatives, Detecting Edges, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

(10 Hrs)

UNIT 3:
The Geometry of Multiple Views: Two Views, Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, Segmentation by Clustering: What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

(10 Hrs)

UNIT 4:
Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.

(10 Hrs)

UNIT 5:
Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering,

Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

(10 Hrs)

Text Books:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

Reference Books:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.

B.Sc.(CS)E 6.3B-DSE-2F: Elective-2: CYBER SECURITY

Total: 48 Hours

UNIT 1:
Introduction: Cyber Attacks, Defence Strategies and Techniques, Guiding Principles, Mathematical Background for Cryptography - Modulo Arithmetic's, The Greatest Comma Divisor, Useful Algebraic Structures, Chinese Remainder Theorem, Basics of Cryptography - Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties, Secret Key Cryptography – Product Ciphers, DES Construction.

(12 Hrs)

UNIT 2:
Public Key Cryptography and RSA: RSA Operations, Why Does RSA Work?, Performance, Applications, Practical Issues, Public Key Cryptography Standard (PKCS), Cryptographic Hash - Introduction, Properties, Construction, Applications and Performance, The Birthday Attack, Discrete Logarithm and its Applications - Introduction, Diffie-Hellman Key Exchange, Other Applications.

(12 Hrs)

UNIT 3:
Key Management: Introduction, Digital Certificates, Public Key Infrastructure, Identity–based Encryption, Authentication–I - One way Authentication, Mutual Authentication, Dictionary Attacks, Authentication – II – Centalised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics, IPSec Security at the Network Layer – Security at Different layers: Pros and Cons, IPSec in Action, Internet Key Exchange (IKE) Protocol, Security Policy and IPSEC, Virtual Private Networks, Security at the Transport Layer - Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, Open SSL.

(12 Hrs)

UNIT 4:
IEEE 802.11 Wireless LAN Security: Background, Authentication, Confidentiality and Integrity, Viruses, Worms, and Other Malware, Firewalls – Basics, Practical Issues, Intrusion

Prevention and Detection - Introduction, Prevention Versus Detection, Types of Instruction Detection Systems, DDoS Attacks Prevention/Detection, Web Service Security – Motivation, Technologies for Web Services, WS- Security, SAML, Other Standards.

(12 Hrs)

<u>**Text Books:**</u>

1. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition

<u>**Reference Books:**</u>

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyay, Mc-GrawHill, 3rd Edition, 2015.
2. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition.
3. Cyber Law simplified- Vivek Sood, Mc-GrawHill, 11th reprint , 2013.
4. Cyber security and Cyber Laws, Alfred Basta, Nadine Basta, Mary brown, ravindra kumar, Cengage learning.

B.Sc.(CS)E 6.3C-DSE-2F: Elective-2: NETWORK SECURITY

Total: 48 Hours

UNIT 1
CRYPTOGRAPHY: Introduction to Cryptography, Two Fundamental Cryptographic Principles, Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and blockciphers - Modern Block Ciphers: Block ciphers principals.

(8 Hrs)

UNIT 2:
Symmetric-Key Algorithms: DES—The Data Encryption Standard, AES—The Advanced Encryption Standard, Cipher Modes, Other Ciphers, Cryptanalysis, PUBLIC-KEY ALGORITHMS, RSA, Other Public-Key Algorithms, DIGITAL SIGNATURES, symmetric-Key Signatures, Public-Key Signatures, Message Digests, The Birthday Attack.

(14 Hrs)

UNIT 3:
Management Of Public Keys: Certificates, X.509, Public Key Infrastructures, communication security, IPsec, Firewalls, Virtual Private Networks, Wireless Security.

(10 Hrs)

UNIT 4:
Authentication Protocols: Authentication Based on a Shared Secret Key, Establishing a Shared Key: The Diffie-Hellman Key Exchange, Authentication Using a Key Distribution Center, Authentication Using Kerberos, Authentication Using Public-Key Cryptography.

(10 Hrs)

UNIT 5:
Email Security: PGP—Pretty Good Privacy, S/MIME, WEB SECURITY, Threats, Secure Naming, SSL—The Secure Sockets Layer, Mobile Code Security.

(6 Hrs)

Text Books:

1. William Stallings, "Crpyptography and Network security Principles and Practices",Pearson/PHI.
2. Tannenbaum, wetherall, "Computer Networks:, Pearson.

Reference Books:

1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing –Prentice Hall of India.

B.Sc.(CS)E 6.4A-DSE-3F: Elective-3: MOBILE APPLICATIONS DEVELOPMENT

Total: 48 Hours

UNIT 1:
Introduction to Mobile Application Development: Preliminary Considerations – Cost of Development –Importance of Mobile Strategies in Business World – Mobile Myths – Third-Party Frameworks. **Mobile Applications**: Mobile Web Presence - Marketing – Web Services for Mobile Devices – Web Services Languages.

(8 Hrs)

UNIT 2:
Mobile User Interface Design: Effective Use of Screen Real Estate – Understanding Mobile Application Users – Understanding Mobile Information Design – Understanding Mobile Platforms. **Mobile Websites:** Choosing a Mobile Web Option – Adaptive Mobile Websites – Dedicated Mobile Websites - Mobile Web Applications with HTML 5.

(10 Hrs)

UNIT 3:
Getting Started with Android: Why Target Android? - Getting the Tools You Need , Anatomy of an Android Application Android User Interface: Understanding Components of a Screen – Adapting to Display Orientation – Managing Changes to Screen Orientation – Creating User Interface Programmatically – Listening for UI Notifications.

(10 Hrs)

UNIT 4:
Types of Views: Designing Your User interface using Views – Displaying Pictures and Menus with Views – AnalogClock and DigitalClock Views Data Persistence: Saving and loading user Preferences - Persisting data to files – Creating and using Data bases– Content Providers

(10 Hrs)

UNIT 5:
Android Messaging and Networking: SMS Messaging – Sending SMS – Receiving SMS - Sending E-mail Location Based Services: Displaying Maps – Obtaining Map API Key – Displaying the Map – Zoom Control – Changing Views – Navigating – Adding Markers – Getting the Location that was Touched – Geocoding and Reverse Geocoding .

(10 Hrs)

Text Books:

1. Professional Mobile Application Development, Jeff McWherter and Scott Gowell,2012, Wrox Publishers.
2. Beginning Android Application Development, Wei – Meng Lee, Wiley, 2011.

Reference books:

1. Professional Android 4 Application Development, Reto Meier, Wrox Publications, 2012.
2. Beginning iOS6 Development: Exploring the iOS SDK, David Mark, Jack Nutting, Jeff LaMouche, and Fredric Olsson, Apress, 2013.
3. Android in Practice, Charlie Collins, Michael Galpin and Matthias Kappler, Dream Tech, 2012

B.Sc.(CS)E 6.4B-DSE-3F: Elective-3: CLOUD COMPUTING

Total: 48 Hours

UNIT 1:
Cloud Computing Basics: Overview, Applications, Intranet and the Cloud, First Movers in the Cloud; The Use of Cloud Computing, Benefits, Security concerns, regulatory issues; Overview of different cloud computing applications that are implemented; Business case for implementing a Cloud: Cloud Computing Services, Applications help to the business, deleting the datacenter, Saleforce.com, Thomson Reuters.

(10 Hrs)

UNIT 2:
Cloud Computing Technology: Hardware and Infrastructure: Clients, Security, Network, Services; Accessing the Clouds: Platforms, Web applications, Web APIs, Web Browsers.

(8 Hrs)

UNIT 3:
Cloud Storage: Overview, Cloud Storage providers, Standards: Applications, Client, Infrastructure, Services.

(8 Hrs)

UNIT 4:
Cloud Computing at Work: Software as a service: Overview, Driving Forces, Company offerings, Industries; Software plus services: Overview, Mobile Device Integration, Providers, Microsoft Online; Developing Applications: Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development: Google, Sales Force, Azure.

(12 Hrs)

UNIT 5:
Local Clouds and Thin Clients: Virtualization, server solutions, Thin Clients; Migrating to the clouds: Cloud services for individuals, Cloud services aimed at Mid-market, and Enterprise-Class, Migration; Best practices and the future of Cloud computing: analyzing the services, Best practices, How Cloud Computing might evolve.

(10 Hrs)

Text Books:

1. Cloud Computing a Practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL, 2010 Edition.

Reference Books:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamari Selvi, McGraw Hill Education (India) Private Limited.
2. Distributed and Cloud Computing, Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, Morgan Kaufmann Publishers 2012.
3. Cloud computing, Barrie Sosinsky, Wiley India.
4. Cloud Computing, Kumar Saurabh, 2nd Edition, Wiley, India

B.Sc.(CS)E 6.4C-DSE-3F: Elective-3: SYSTEM PROGRAMMING

Total: 48 Hrs

UNIT 1:
Background: Machine Structure, Evolution of the Components of a Programming System. Assembler, Loaders, Macros, Compilers, Formal Systems, **Machine Structure:** General Machine Structure, Instruction format, Representation of 360/370 instructions, Machine Language and Assembly Language.

(12 Hrs)

UNIT 2:
Assemblers: General design procedure, design of Assembler, statement of problem, data Structure, Format of Date bases, Algorithm for pass 1 and pass 2, look for modularity, Explanation along with flowcharts for both pass 1 and pass 2 (detail flowchart).**Table Processing**: Searching & Sorting - Linear and binary search, comparison, examples. Interchange sort, shell sort, bucket sort, radix exchange sort, address calculation sort, Random entry searching.

(9 Hrs)

UNIT 3:
Macro Language and The Macro Processor: Introduction, Macro instructions, Features of macro facility-macro instruction arguments, Conditional macro Expansion, Macro calls within macro, Macro instruction defining macro implementation: statement of problem, Specification of databases and specification of database format, Algorithm and flowchart for processing macro definitions and macro expansion.

(9 Hrs)

UNIT 4:
Loaders: Introduction, Loader schemes-compile and go loader scheme, general loader, Absolute loader, Sub routine linkage, Relocating loader, Direct linking loader, overlays, Dynamic loading.

(9 Hrs)

UNIT 5:

Compilers: Introduction, Statement of problem, Phases of compiler, Lexical phase, syntax phase, interpretation phase optimization phase, storage assignment phase, code generation phase, Assembly phase, passes of compiler. Data Structures: statement of problem, storage classes and its use.

(9 Hrs)

<u>**Text Books:**</u>

1. John J. Donowon, System Programming, TATA McGraw Hill.
2. Beck: System Software, 3/e Pearson Education.
3. System Software – Leland L. Beck, Third edition, Addison Wesley 1997

<u>**Reference Books:**</u>

1. Dhamdhere: System Programming and Operating System TMH Laudon & Laudon, Management Information Systems, 8/e Pearson Education

B.Sc.(CS) 6.5-SEC-1F: MINI PROJECT-II

Theory, Practical and Project Examination Scheme

Question Paper Pattern for all semester except AECC

1. Question number 1-12 carries 2 marks to answer any 10 questions   : **20 Marks**
2. Question number 13-21 carries 5 marks to answer any 6 questions   : **30 Marks**
3. **Question number 22-26 carries 10 marks to answer any 3 questions : **30 Marks**

Total: 80 Marks

Practical Evaluation Scheme

Practical Examination- 40 Marks   **Duration - 3 Hours**.

Certified Journal is compulsory for appearing Practical Examination, students shall be given two programming assignments taking into consideration of duration of the time allotted to students for writing, typing and executing the programs.

Algorithm/Program writing   : **14 Marks (7 Marks each)**
Execution   : **16 Marks (8 Marks each)**
(Includes program code correctness and correct execution results)
Journal   : **05 Marks**
Viva-Voce   : **05 Marks**

Total   **: 40 Marks**

Execution of the Project:

- The students are required to carry out the project in a group of two students under the guidance of course teacher.
- Project work problem statement shall be identified by the students with the help of the course teachers and students shall submit the synopsis/project proposal of the same during the second week of the commencement of V and VI semester B.Sc.(CS) programme.
- During project development students are expected to define a project problem, do requirements analysis, systems design, software development, apply testing strategies and do documentation with an overall emphasis on the development of a robust, efficient and reliable software systems.
- No change in the title of the project work shall be allowed after 3rd week of the commencement of V and VI semester B.Sc.(CS) programme.
- The project development process has to be consistent and should follow standards identified by the guide monitoring the project work.
- There is no restriction on use of hardwares and softwares for carrying out the project work except that ready application packages are not allowed.
- The students have to submit the project dissertation of the project work carried out in one hard copy along with soft copy written on compact disc.

Project Evaluation Scheme : Main Examination

Max. Marks: 40   **Time: 3 Hours**

1. Dissertation/Project Report evaluation   : **20 Marks**

2. Presentation/Demo of the application developed   : **10 Marks**
(navigation of the application, features incorporated, data validation, UI, reports, etc.)

3. Viva-voce   : **10 Marks**

                        Total   : 40 Marks

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