B.S. Abdur Rahman

Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

Regulations 2019
Curriculum and Syllabi

(Amendments updated upto June 2020)

M.C.A
(Master of Computer Applications)

REGULATIONS 2019
CURRICULUM AND SYLLABI
(Amendments updated up to June 2020)

M.C.A.
MASTER OF COMPUTER APPLICATIONS

VISION AND MISSION OF THE INSTITUTION

VISION

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

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- To achieve excellence in all its endeavors to face global challenges.
- To provide excellent teaching and research ambience.
- To network with global Institutions of Excellence, Business, Industry and Research Organizations.
- To contribute to the knowledge base through Scientific enquiry, Applied Research and Innovation.

VISION AND MISSION OF THE

DEPARTMENT OF COMPUTER APPLICATIONS

VISION

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

MISSION

The Department of Computer Applications, endeavours

- To disseminate knowledge through education and training of graduates in the field of computer applications.

- To focus on teaching - learning, research and consultancy to promote excellence in computer applications.

- To foster graduates with opportunities required to explore, create and face challenges of IT related industries.

- To equip the graduates with the necessary skills in communication, team work and leadership qualities to meet the needs of the IT related sector globally.

- To disseminate the outcome of projects and research work undertaken by the department through appropriate measures for the benefit of society and industry.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Programme Educational Objectives of MCA (Master of Computer Applications) describe the accomplishments that the programme is preparing graduates to achieve.

PEO-1: To provide students with a solid foundation in mathematics and computing fundamentals required to analyse, apply, solve real time problems and pursue higher studies & research.

PEO-2: To provide technical knowledge in various programming languages and train them to comprehend, analyse, design and create innovative computing solutions for real time problems.

PEO-3: To prepare the students for a prolific career in IT and inculcate an urge for self-learning by providing an ambient environment to improve personality, excellence, leadership and spiritual values in all activities throughout the career.

PEO-4: To foster and provide a social environment which molds the students to become professionally enriched with communication, technical and innovative skills to meet the dynamic needs of industry and society.

PROGRAMME OUTCOMES

The programme outcomes of MCA describe the acquirement of students as they progress through the programme.

PO1: Apply the knowledge of computing fundamentals and mathematical concepts in computer programming.

PO2: Identify, formulate, analyze and implement mathematics and technical skills to solve real time problems.

PO3: Design and develop the software to meet out the customer and industry needs.

PO4: Pursue research based and industry-oriented projects to provide valid conclusions for complex problems.

PO5: Use latest software and tools for solving problems and satisfy the dynamic needs of industry and society.

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

PO7: Solve societal and environmentally sensitive problems in professional manner.

PO8: Demonstrate knowledge of professional and ethical responsibilities.

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

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

PO11: Adapt self-learning using their learning abilities.

PO12: Develop as entrepreneur in the software domain through innovative approach and excel in placement activities.

PROGRAMME SPECIFIC OUTCOMES

The graduates of the department will attain the ability

PSO1: To analyze, design and develop skills for real-time/industry or research projects in cloud computing /mobile applications / Data analytics technologies with vertical specialization.

PSO2: To design and develop software products/services/solutions using appropriate tools and techniques for real time mobile, desktop and web applications.

B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE & TECHNOLOGY, CHENNAI – 600 048.

REGULATIONS - 2019 FOR

M.Tech. / MCA / M.Sc. DEGREE PROGRAMMES

(Under Choice Based Credit System)

1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires **"Programme"** means Post Graduate Degree Programme (M.Tech. / MCA / M.Sc.)

"Course" means a theory / practical / laboratory integrated theory / mini project / seminar / internship / Project and any other subject that is normally studied in a semester like Advanced Concrete Technology, Electro Optic Systems, Financial Reporting and Accounting, Analytical Chemistry, etc.,

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

"Academic Council" means the Academic Council, which is the apex body on all academic matters of B.S. Abdur Rahman Crescent Institute of Science & Technology.

"Dean (Academic Affairs)" means Dean (Academic Affairs) of B.S. Abdur Rahman Crescent Institute of Science & Technology who administers the academic matters.

"Dean (Student Affairs)" means Dean (Student Affairs) of B.S. Abdur Rahman Crescent Institute of Science & Technology, who looks after the welfare and discipline of the students.

"Controller of Examinations" means the Controller of Examinations of B.S. Abdur Rahman Crescent Institute of Science & Technology who is responsible for the conduct of examinations and declaration of results.

2.0 PROGRAMMES OFFERED AND ADMISSION REQUIREMENTS

2.1 Programmes Offered

The various programmes and their mode of study are as follows:

Degree	Mode of Study
M.Tech.	Full Time
MCA	
M.Sc.	

2.2 ADMISSION REQUIREMENTS

2.2.1 Students for admission to the first semester of the Master's Degree Programme shall be required to have passed the appropriate degree examination of this Institution as specified in the clause 3.2 [Eligible entry qualifications for admission to P.G. programmes] or any other degree examination of any University or authority accepted by this Institution as equivalent thereto.

2.2.2 Eligibility conditions for admission such as class obtained, number of attempts in the qualifying examination and physical fitness will be as prescribed by the Institution from time to time.

3.0 DURATION, ELIGIBILITY AND STRUCTURE OF THE PROGRAMME

3.1. The minimum and maximum period for completion of the Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
M.Tech.	4	8
MCA (3 years)	6	12
MCA (Lateral Entry)	4	8
MCA (2 years)	4	8
M.Sc.	4	8

3.1.1 Each academic semester shall normally comprise of 90 working days. Semester End Examinations shall follow within 10 days of the last Instructional day.

3.1.2 Medium of instruction, examinations and project report shall be in English.

3.2 ELIGIBLE ENTRY QUALIFICATIONS FOR ADMISSION TO PROGRAMMES

Sl. No.	Name of the Department	Programmes offered	Qualifications for admission
1.	Aeronautical Engineering	M. Tech. (Avionics)	B.E. / B. Tech. (Aeronautical Engineering)
2.	Civil Engineering	M. Tech. (Structural Engineering)	B.E. / B. Tech. (Civil Engineering) / (Structural Engineering)

		M. Tech. (Construction Engineering and Project Management)	B.E. / B. Tech. (Civil Engineering) / (Structural Engineering) / B. Arch.
3.	Mechanical Engineering	M.Tech. (Manufacturing Engineering)	B.E. / B.Tech. (Mechanical / Automobile / Manufacturing / Production / Industrial / Mechatronics / Metallurgy / Aerospace /Aeronautical / Material Science / Marine Engineering)
		M.Tech. (CAD/CAM)	
4.	Electrical and Electronics Engineering	M.Tech. (Power Systems Engg.)	B.E. / B. Tech. (EEE/ECE/E&I/I&C / Electronics / Instrumentation)
		M.Tech. (Power Electronics and Drives)	
5.	Electronics and Communication Engineering	M.Tech. (Communication Systems)	B.E. / B. Tech. (EEE/ ECE / E&I / CSE IT / I&C / Electronics / Instrumentation)
		M.Tech. (VLSI and Embedded Systems)	B.E. / B. Tech. (ECE / E&I / I&C / EEE / CSE / IT)
6.	Electronics and Instrumentation Engineering	M.Tech. (Electronics and Instrumentation Engineering)	B.E. / B. Tech. (EIE/ICE/Electronics/ECE/EEE)
7.	Computer Science and Engineering	M.Tech. (Computer Science and Engineering)	B.E. / B. Tech. (CSE/IT/ECE/EEE/EIE/ICE/ Electronics / MCA)
8.	Information Technology	M.Tech. (Information Technology)	B.E. / B. Tech. (IT/CSE/ECE/EEE/EIE/ICE/ Electronics / MCA)

9.	Computer Applications	MCA (3 years)	Bachelor Degree in any discipline with Mathematics as one of the subjects (or) Mathematics at +2 level
		MCA – (Lateral Entry)	B.Sc. Computer Science / B.Sc. Information Technology / BCA
		MCA (2 years)	Bachelor Degree in any discipline with Mathematics as one of the subjects (or) Mathematics at +2 level or B.Sc. Computer Science / B.Sc. Information Technology / BCA
10.	Mathematics	M.Sc. (Actuarial Science)	Any Degree with Mathematics / Statistics as one of the subjects of study
11.	Physics	M.Sc.(Physics)	B.Sc. (Physics / Applied Science / Electronics / Electronics Science / Electronics & Instrumentation)
12.	Chemistry	M.Sc.(Chemistry)	B.Sc. (Chemistry / Applied Science)
13.	Life Sciences	M.Sc. Molecular Biology & Biochemistry	B.Sc. in any branch of Life Sciences
		M.Sc. Biotechnology	B.Sc. in any branch of Life Sciences
		M.Sc. Microbiology	B.Sc. in any branch of Life Sciences
		M.Tech. Biotechnology	B.Tech. (Biotechnology / Chemical Engineering) / M.Sc. in any branch of Life Sciences

3.3. STRUCTURE OF THE PROGRAMME

3.3.1 The PG. programmes consist of the following components as prescribed in

the respective curriculum

   i. Core courses

   ii. Elective courses

   iii. Laboratory oriented core courses

   iv. Project work / thesis / dissertation

   v. Laboratory Courses

   vi. Seminars

   vii. Mini Project

   viii. Industrial Internship

   ix. Value Added Courses

   x. MOOC Courses (NPTEL, SWAYAM, etc.,)

3.3.2 The curriculum and syllabi of all programmes shall be approved by the Academic Council of this Institution.

3.3.3 For the award of the degree, the student has to earn a minimum total credits specified in the curriculum of the respective specialization of the programme.

3.3.4 The curriculum of programmes shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits specified below:

Programme	Range of credits
M.Tech.	74 - 80
MCA (3 years)	118 - 126
MCA (Lateral Entry)	80 - 85
MCA (2 years)	85 - 90
M.Sc.	77- 82

3.3.5 Credits will be assigned to the courses for all programmes as given below:

❖ One credit for one lecture period per week or 15 periods of lecture per semester

❖ One credit for one tutorial period per week or 15 periods per semester

❖ One credit each for seminar/practical session/project of two or three periods per week or 30 periods per semester

❖ One credit for four weeks of industrial internship or 160 hours per semester.

3.3.6 The number of credits the student shall enroll in a non-project semester and

project semester is as specified below to facilitate implementation of Choice Based Credit System.

Programme	Non-project semester	Project semester
M.Tech.	9 to 28	18 to 26
MCA	12 to 33	12 to 26
M.Sc.	9 to 32	10 to 26

3.3.7 The student may choose a course prescribed in the curriculum from any department offering that course without affecting regular class schedule. The attendance will be maintained course wise only.

3.3.8 The students shall choose the electives from the curriculum with the approval of the Head of the Department / Dean of School.

3.3.9 Apart from the various elective courses listed in the curriculum for each specialization of programme, the student can choose a maximum of two electives from any other similar programmes across departments, during the entire period of study, with the approval of the Head of the department offering the course and parent department.

3.4. ONLINE COURSES

3.4.1 Students are permitted to undergo department approved online courses under SWAYAM up to 20% of credits of courses in a semester excluding project semester with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

3.4.2 Students shall undergo project related online course on their own with the mentoring of the faculty member.

3.5 PROJECT WORK / DISSERTATION

3.5.1 Project work / Dissertation shall be carried out by the student under the supervision of a Faculty member in the department with similar specialization.

3.5.2 A student may however, in certain cases, be permitted to work for the project in an Industry / Research Organization, with the approval of the Head of the Department/ Dean of School. In such cases, the project work shall be jointly

supervised by a faculty of the Department and an Engineer / Scientist from the organization and the student shall be instructed to meet the faculty periodically and to attend the review meetings for evaluating the progress.

3.5.3 The timeline for submission of final project report / dissertation is within 30 calendar days from the last Instructional day of the semester in which Project / Dissertation is done.

3.5.4 If a student does not comply with the submission of project report / dissertation on or before the specified timeline he / she is deemed to have not completed the project work / dissertation and shall re-register in the subsequent semester.

4.0 CLASS ADVISOR AND FACULTY ADVISOR

4.1 CLASS ADVISOR

A faculty member shall be nominated by the HOD / Dean of School as Class Advisor for the whole class. He/she is responsible for maintaining the academic, curricular and co-curricular records of all students throughout their period of study.

4.2 FACULTY ADVISOR

To help the students in planning their courses of study and for general counseling on the academic programme, the Head of the Department / Dean of School of the students shall attach a certain number of students to a faculty member of the department who shall function as Faculty Advisor for the students throughout their period of study. Such Faculty Advisor shall offer advice to the students on academic and personal matters, and guide the students in taking up courses for registration and enrolment in every semester.

5.0 CLASS COMMITTEE

5.1 A class committee comprising faculty members handling the classes, student representatives and a senior faculty member not handling the courses as chairman will be constituted in every semester:

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

    i) One senior faculty member preferably not handling courses for the concerned semester, appointed as chairman by the Head of the Department

    ii) Faculty members of all courses of the semester

  iii) All the students of the class

  iv) Faculty advisor and class advisor

  v) Head of the Department – Ex officio member

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

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

5.5 The third meeting of the class committee, excluding the student members, shall meet within 5 days from the last day of the semester end examination to analyze the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

6.0 COURSE COMMITTEE

6.1 Each common theory / laboratory course offered to more than one group of students shall have a "Course Committee" comprising all the teachers handling the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending upon whether all the teachers handling the common course belong to a single department or from several departments. The Course Committee shall meet as often as possible to prepare a common question paper, scheme of evaluation and ensure uniform evaluation of the assessment tests and semester end examination.

7.0 REGISTRATION AND ENROLLMENT

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

7.2 For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous semester.

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

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

8.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

8.1 A student may be permitted by the Dean (Academic Affairs) to avail temporary break of study from the programme up to a maximum of two semesters for reasons of ill health or other valid grounds. A student can avail the break of study before the start of first assessment test of the ongoing semester. However the total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 3.1). If any student is debarred for want of attendance or suspended due to any act of indiscipline, it will not be considered as break of study. A student who has availed break of study has to rejoin in the same semester only in the subsequent year. The student availing break of study is permitted to write arrear examinations by paying the prescribed fees.

9.0 MINIMUM REQUIREMENTS TO REGISTER FOR PROJECT / DISSERTATION

9.1 A student is permitted to register for project semester, if he/she has earned the minimum number of credits specified below:

Programme	Minimum no. of credits to be earned to enroll for project semester
M.Tech.	18
MCA (3 years)	45
MCA (Lateral Entry)	22
MCA (2 years)	22
M.Sc.	18

9.2 If the student has not earned minimum number of credits specified, he/she has to earn the required credits, at least to the extent of minimum credits specified in clause 9.1 and then register for the project semester.

10.0 ATTENDANCE

10.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% (for genuine reasons such as medical grounds, representing for the institution in approved events, etc.) to become eligible to appear for the semester end examination in that course, failing which the student shall be awarded "I" grade in that course. The courses in which the student is awarded "I" grade, shall register and redo the course when it is offered next.

10.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in that course to the Class Advisor. The Class Advisor will consolidate and furnish the list of students who have earned less that 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department / Dean of School. Thereupon, the Dean (Academic Affairs) shall announce the names of such students prevented from writing the semester end examination in each course.

10.3 A student who has obtained 'I' grade in all the courses in a semester is not permitted to move to next higher semester. Such student shall redo all the courses of the semester in the subsequent academic year. However he / she is permitted to redo the courses awarded with 'I' grade / arrear in previous semesters. They shall also be permitted to write arrear examinations by paying the prescribed fee.

10.4 A student shall register to redo a core course wherein "I" or "W" grade is awarded. If the student is awarded, "I" or "W" grade in an elective course either the same elective course may be repeated or a new elective course may be chosen with the approval of Head of the Department / Dean of School.

11.0 REDO COURSES

11.1 A student can register for a maximum of two redo courses per semester in the evening after regular working hours, if such courses are offered by the concerned department. Students may also opt to redo the courses offered

during regular semesters, without affecting the regular academic schedule and not exceeding prescribed maximum credits.

11.2 The Head of the Department with the approval of Dean (Academic Affairs) may arrange for the conduct of a few courses in the evening after regular working hours, depending on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

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

12.0 ASSESSMENTS AND EXAMINATIONS

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

Assessments	Weightage of Marks
Continuous Assessment 1	25%
Continuous Assessment 2	25%
Semester End Examination	50%

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

Every practical course shall have 75% weightage for continuous assessments and 25% for semester end examination. However a student should have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

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

evaluation of practical component shall be through continuous assessment.

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

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

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

12.7 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance shall be considered for grading along with the marks scored in the semester end arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination to award grades and the internal assessment marks secured during the course of study shall not be considered.

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

13.0 SUBSTITUTE EXAMINATIONS

13.1 A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional

circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of School for that purpose. However there is no substitute examination for semester end examination.

13.2 A student shall apply for substitute exam in the prescribed form to the Head of the Department / Dean of School within a week from the date of assessment test. However the substitute examination will be conducted only after the last working day of the semester and before the semester end examination.

14.0 SUPPLEMENTARY EXAMINATION

14.1 Final Year students can apply for supplementary examination for a maximum of three courses thus providing an opportunity to complete their degree programme. Likewise students with less credit can also apply for supplementary examination for a maximum of three courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three weeks of the declaration of results in both odd and even semester.

15. PASSING, DECLARATION OF RESULTS AND GRADE SHEET

15.1 All assessments of a course shall be made on absolute marks basis. However, the Class Committee without the student members shall meet within 5 days after the semester end examination and analyze the performance of students in all assessments of a course and award letter grades. The letter grades and the corresponding grade points are as follows:

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

"W"   denotes withdrawal from the course.

"I"   denotes inadequate attendance and hence prevented from appearing for semester end examination

"U"   denotes unsuccessful performance in the course.

"AB" denotes absence for the semester end examination.

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

15.3   The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department / Dean of School and it shall be declared by the Controller of Examinations.

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

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

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

If C_i, is the number of credits assigned for the ith course and GP_i is the Grade Point in the ith course

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

Where n = number of courses

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

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

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

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

Percentage Equivalent of Marks = CGPA X 10

15.6 After successful completion of the programme, the Degree shall be awarded upon fulfillment of curriculum requirements and classification based on CGPA as follows:

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within the minimum prescribed period.
First Class	6.50 and above and completing the programme within a minimum prescribed period plus two semesters.
Second Class	Others

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

16.0 DISCIPLINE

16.1 Every student is expected to observe disciplined and decorous behaviour both inside and outside the campus and not to indulge in any activity which tends

to affect the reputation of the Institution.

16.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action.

17.0 ELIGIBILITY FOR THE AWARD OF THE MASTERS DEGREE

17.1 A student shall be declared to be eligible for the award of the Masters Degree, if he/she has:

i. Successfully acquired the required credits as specified in the curriculum corresponding to his/her programme within the stipulated time.

ii. No disciplinary action is pending against him/her.

iii. Enrolled and completed at least one value added course.

iv. Enrollment in at least one MOOC / SWAYAM course (non-credit) before the final semester.

17.2 The award of the degree must have been approved by the Institute.

18.0 POWER TO MODIFY

Not withstanding all that have been stated above, the Academic Council has the right to modify any of the above regulations from time to time.

****

B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY

**REGULATIONS 2019 CURRICULUM & SYLLABI FOR
MASTER OF COMPUTER APPLICATIONS
(FOUR SEMESTERS / FULL TIME)
(Candidates admitted from the academic year 2020-21 onwards)**

S. No.	Course Code	Course Title	L	T	P	C
		SEMESTER 1				
1	MAD 6188	Mathematical Foundation for Computer Applications	3	1	0	4
2	CAD 6121	Computer Organization and Operating system	3	0	0	3
3	CAD 6122	Database Management Systems	3	0	0	3
4	CAD 6123	Computer Networks	3	0	0	3
5	CAD 6124	Data structures and Algorithms using C/C++	3	0	0	3
6	CAD6125	Object Oriented Software Engineering	3	0	0	3
7	CAD 6126	Data structures and Algorithms Laboratory using C/C++	0	0	2	1
8	CAD 6127	Programming in C and C++ Laboratory	0	0	2	1
9	CAD 6128	DBMS Laboratory	0	0	2	1
						22
		SEMESTER 2				
1	CAD 6221	Programming in Java	3	0	0	3
2	CAD 6222	Resource Management Techniques	3	1	0	4
3	CAD 6223	Cloud Computing	3	0	0	3
4	CAD 6224	Mobile Application Development	3	0	0	3
5	CAD 6225	Introduction to Data Science	3	0	0	3

6		Elective I	3	0	0	3
7	CAD 6226	Communication Skills Laboratory	0	0	2	1
8	CAD 6227	Advanced Technology Laboratory (Cloud/Mobile/Data Science)	0	0	2	1
9	CAD 6228	Programming in JAVA Laboratory	0	0	2	1
						22

SEMESTER 3

1	CAD 7121	Python Programming	3	0	0	3
2	CAD 7122	Internet of Things	3	0	1	4
3	CAD 7123	Big Data Analytics	3	0	0	3
4	CAD 7124	Machine Learning Techniques	3	0	0	3
5	CAD 7125	Advanced Web Development and Services	3	0	1	4
6		Elective – II	3	0	0	3
7	CAD 7126	Organizational Behaviour	3	0	0	3
8	CAD 7127	Python Programming Laboratory	0	0	2	1
9	CAD 7128	Mini Project	0	0	2	1
						25

SEMESTER 4

| 1 | CAD 7221 | Project | | | | 18 |

TOTAL CREDITS   87

Note (Mandatory Course for completion of degree):

- **Students must have enrolled and completed at least one value added course.**

- **Also enrollment in at least one MOOC / SWAYAM course (non-credit) before the final semester.**

PROGRAMME ELECTIVES

S. No.	Course Code	Course Title	L	T	P	C
		SEMESTER 2				
1	CADY 251	Digital Marketing	3	0	0	3
2	CADY 252	Management Information Systems	3	0	0	3
3	CADY 253	Multimedia Systems and Computer Graphics	3	0	0	3
		SEMESTER 3				
Mobile Applications						
1	CADY351	Mobile Commerce	3	0	0	3
2	CADY352	Mobile Security	3	0	0	3
3	CADY353	Mobile and Digital Forensics	3	0	0	3
Cloud Technology						
4	CADY 354	Principles of Virtualization	3	0	0	3
5	CADY 355	Cloud Architectures	3	0	0	3
6	CADY 356	Cloud Storage Infrastructures	3	0	0	3
7	CADY 357	Cloud Security	3	0	0	3
8	CADY 358	Information Storage and Management	3	0	0	3
Web Applications and Development						
9	CADY 359	Semantic Web	3	0	0	3
10	CADY 360	Content Management System	3	0	0	3
11	CADY 361	PHP Programming	3	0	0	3
12	CADY 362	Web Mining	3	0	0	3

IOT and Big data

13	CADY 363	Data Mining and Data warehousing	3	0	0	3
14	CADY 364	Data Analytics AND Visualization	3	0	0	3
15	CADY 365	Social Media analytics	3	0	0	3
16	CADY 366	Health care analytics	3	0	0	3
17	CADY 367	R Programming	3	0	0	3
18	CADY 368	Decision Support System	3	0	0	3
19	CADY 369	Predictive Analysis	3	0	0	3

SEMESTER I

MAD 6188   **MATHEMATICAL FOUNDATION FOR**   **L T P C**
                             COMPUTER APPLICATIONS

                                                                      3 1 0 4

OBJECTIVES:

The objective of this course is to

- Provide mathematical background on Number System and Combinatorics
- Give Sufficient exposure to Propositions and Logical operations
- Deal and solve problems on Matrices
- Familiarize the concepts in Set Theory
- Explain the concepts in Graph Theory

MODULE I   **NUMBER SYSTEMS, COMBINATORICS**   **12**

Decimal Number System - Binary Number System - Hexadecimal Number System - Octal Number System - Permutations and Combinations - Mathematical Induction - Pigeonhole principle

MODULE II   **PROPOSITIONS AND LOGICAL OPERATIONS**   **12**

Notation - Connections - Normal forms - Truth Tables - Equivalence and Implications - Theory of inference for statement calculus, Predicate calculus - Rules of Logic Mathematical Induction and Quantifiers

MODULE III   **MATRICES**   **12**

Matrices: Definition and Classification - Algebra of Matrices - Special Matrices - Elementary Operations of a Matrix. Determinants : Definitions & Properties - Minors and Cofactors -Operations on Determinants -Determinants: System of Linear Equations-Characteristic Equation- Eigen values and Eigenvectors.

MODULE IV   **SETS AND RELATIONS**   **12**

Basic concepts of Sets - Set Operations and Venn Diagrams - Set Identities Cartesian products - Power sets - Representation and Properties of Relations.

MODULE V   GRAPH THEORY   12

Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut- Sets.

Total Hours: 60

TEXT BOOKS :

1. Judith L. Gersting, "Mathematical Structures for Computer Science", 5th Edition, W.H. Freeman and Company, New York, 2003.

2. Grimaldi R.P. and Ramana B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, Harlow, 2006.

3. Veerarajan.T., "Engineering Mathematics" (5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012.

REFERENCE BOOKS :

1. Grimaldi R.P. and Ramana B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, Harlow, 2006.

2. Trembley.J.P and Manohar R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw – Hill Publishing Company Limited, Reprint, New
Delhi, 2008.

OUTCOMES:

On completion of this course, students will be able to:
- Explain the concepts in Mathematical Induction, Set Theory, Graph theory
- Demonstrate the use of Matrices in solving linear equations
- Apply the Combinatorics, Proposition, Logical Operators involving combinatorics problems
- Solve logical proofs in Mathematical Logics derived from truth tables.
- Apply set operations and functions in solving in Set Problem.

CAD 6121　　　　**COMPUTER ORGANIZATION AND**　　**L　T　P　C**
OPERATING SYSTEM

3　0　0　3

OBJECTIVES:

The objective of this course is to

- Introduce the instruction sets and operations of processor.
- Explain the functions and services of Memory and I/O devices.
- Provideanunderstandingofthemajoroperatingsystemcomponents,services and functions.
- Describe various features of processes and present both software and hardware solutions of the critical section problems.
- Explore the techniques for managing both memory and files.

MODULE I　　　INTRODUCTION TO COMPUTER ORGANIZATION　　9

Functional Units of a Digital Computer: Von Neumann Architecture – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes- Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards..

MODULE II　　　MEMORY AND I/O　　　　　　　9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel And Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

MODULE III　　　INTRODUCTION TO OPERATING SYSTEMS　　9

Role of an Operating System – Types of Operating System – Major OS Components – Operating System Operations – Operating System Services – System calls – System Programs – Operating System Structure – Process Concept – Process Scheduling – Operations on Processes – Inter process Communication.

MODULE IV   PROCESS   MANAGEMENT   9

Basic Concepts of Scheduling – Scheduling Criteria – Scheduling Algorithms – FCFS – SJF – Round Robin -Critical Section Problem – Semaphores – Monitors – Dining Philosophers Solutions Using Monitors – Implementation of Monitor Using Semaphores.

MODULE V   MEMORY AND FILE MANAGEMENT   9

Swapping – Contiguous Memory Allocation – Paging – Segmentation – Virtual Memory – Demand Paging – Copy-on-Write – File system Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.-File System Implementation- Case study of Linux and Window operating systems.

Total Hours: 45

TEXT BOOKS :

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.

2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann/Elsevier, 2013.

3. Abraham Silberschatz, Peter B galvin , Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley & Sons Inc, 2013.

4. Deitel H M, "Operating Systems", 3rd Edition, Pearson education India, New Delhi, 2015.

REFERENCE BOOKS :

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

2. Andrew S. Tanenbaum, "Modern Operating Systems", Adison Wesley, 2009.

OUTCOMES:

On completion of this course, students will be able to

- Analyze the structure of a digital computer and demonstrate programming proficiency using the various addressing modes and the different control systems.

- Analyze the performance of processors and caches.

- Describe the functioning of memory and operations of Input-Output Organization.

- Explain the basic structure and functions of operating systems

- Identify the problems related to process management and synchronization and apply learned methods to solve basic problems.

- Discuss the features of various Memory and File management techniques.

CAD 6122   **DATABASE MANAGEMENT SYSTEMS**   **L T P C**

                                                                  3 0 0 3

OBJECTIVES:

The objective of this course is to:

- Provide an introduction on database and its operations.

- Explain the fundamentals of relational systems including data models, database architectures and database manipulations.

- Train the students to construct simple and moderately advanced database queries using structured query language and apply normalization techniques.

- Educate the concept of database storage & file structure.

- Explore the concept of transaction management and origins of No SQL databases and the characteristics that distinguish them from traditional relational database management systems.

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

Database Systems vs. File Systems - View of Data - Data Models-Database Languages -Transaction Management - Database Systems Structure - History of Database Systems - Database Systems Applications - Entity Relationship Model.

MODULE II   **RELATIONAL DATABASES**   **9**

SQL - Basic Structure - Set Operations - Complex Queries - Joined Queries - DDL- Embedded SQL-Dynamic SQL-Other SQL Functions-Query by Example-Integrity and Security of searching-Relational Database Design.

MODULE III   **NORMALIZATION & QUERY EVALUATION**   **9**

Normalization – Introduction - Non loss decomposition and functional dependencies – First - Second and third normal forms – dependency preservation – Boyce - Codd normal form - Higher Normal Forms – Multi valued dependencies and Fourth normal form - Join dependencies and Fifth normal form - Query Processing - Selection Operation - Sorting - Join Operation - Views - Evaluation of Expressions-Query Optimization.

MODULE IV   **DATA STORAGE AND INDEXING**   **9**

Storage & File Structure-RAID–File Organization–Organization of Records in Files–IndexingandHashing–OrderedIndices–B+treeIndexFiles–BtreeIndex Files –

Static Hashing – Dynamic Hashing.

MODULE V   TRANSACTION MANAGEMENT   9

Transaction Concept - Static Implementation-Concurrency Control – Protocols - Deadlock Handling-Recovery Systems-Recovery with Concurrent Transactions - Shadow Paging - Buffer Management-Case Studies-Oracle-Microsoft SQL Server- NOSQL – Characteristics - major types of NOSQL databases - NOSQL Database-as-a- Service for Web and mobile applications

Total Hours: 45

TEXT BOOKS :

1   Silberschatz, Korth and Sudarshan, "Data Base System Concepts", McGraw- Hill, 6th Edition, 2011

2   Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson,7th Edition,©2016

REFERENCE BOOKS :

1   Raghu Ramakrishnan & Johannes Gerhrke, "Data Base Management Systems", McGraw Hill International 3rd Edition, 2014.

2   An Introduction to Database systems, C.J. Date, A. Kannan, S. SwamiNadhan, Pearson, Eight Edition

OUTCOMES:

On completion of this course, students will be able to

- List the importance of DBMS and differentiate how DBMS is better than traditional

  file processing systems.

- Illustrate the difference between a relational database and anon-relational (NOSQL) database

- Construct and normalize conceptual data models , analyze the basic structure

  of database and recognize the different views of the database.

- Describe the concepts of data storage and indexing, query evaluations and optimization techniques.

- Handle transaction management queries in SQL in real time scenario

CAD 6123 **COMPUTER NETWORKS**

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of this course is to

- Provide students with enough knowledge in networking, various types of networks and its applications.

- Introduce the issues of data link protocols including encoding, framing, and error detection.

- Explain various switching and routing techniques

- Provide essential knowledge about Transport layer issues

- Explore the technologies of Software Defined Networking (SDN),Network Functions Virtualization(NFV)

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

Building a network – Requirements – Network Architecture: – OSI Model – Internet Architecture – Direct Link Networks – Hardware building blocks – Framing – Error detection – Reliable transmission.

MODULE II **NETWORK FUNDAMENTALS** **9**

LAN Technology – LAN Architecture – BUS/Tree – Ring – Star – Ethernet – Token Rings – Wireless Technologies : Examples , Types of connections , Media and latest technologies.

MODULE III **NETWORK LAYER** **9**

Packet Switching – Switching and Forwarding – Bridges and LAN switches – Internetworking – Simple Internetworking – Routing : Types of Routing, Internet routing and protocols.

MODULE IV **TRANSPORT LAYER** **9**

Reliable Byte Stream (TCP) – Simple Demultiplexer (UDP) – TCP Congestion Control – Congestion Avoidance Mechanisms.

MODULE V   PRESENTATION LAYER and APPLICATIONS   9

Presentation formatting – Data compression – Cryptographic Algorithms: RSA - DES –– Applications – Domain Name Service – Email - SMTP – MIME –HTTP – SNMP-Introduction to Software Defined Networking(SDN) and Network Functions Virtualization(NFV)- SDN Fundamentals.

Total Hours: 45

TEXT BOOKS :

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

REFERENCE BOOKS :

1. Erik Dahl man, Stefan Parkville, Johan Skold, "5G NR: The Next Generation Wireless   Access Technology, Academic Press, 09-Aug-2018

2 James F. Kurose and Keith W. Ross, "Computer Networking - A Top Down Approach featuring the Internet", 4th Edition, Addison Wesley Publishing Company, 2007

3 William Stallings, "Data and Computer Communications", 7th Edition, PHI, 2011

4 Andrew S. Tanenbaum, "Computer Networks", Tata Mcgraw Hill, 5th Edition, 2013.

OUTCOMES:

On completion of this course, students will be able to

- Identify and describe the layers of the OSI and TCP/IP.
- List the applications of wireless network technologies
- Make effective use of networking topologies.
- Identify the requirements for different network architecture.
- Summarize the features of an emerging paradigm software defined networking (SDN) in computer networking.

CAD 6124 **DATA STRUCTURES AND ALGORITHMS USING C/C++**

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of this course is to

- Study the importance of data structures in context of writing efficient programs.
- Explore the different types of searching and sorting algorithms.
- Explain basic data structures such as arrays, linked lists, stacks and queues.
- Introduce various algorithmic techniques to solve the problems
- Demonstrate the appropriate data structure and algorithm design method for a specified application.

MODULE I **INTRODUCTION TO DATA STRUCTURES** **9**

Introduction to data structures, Classifications: Primitive and non primitive, Dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, , Memory allocation functions: malloc(), calloc(), free() and realloc().Stack- Operations on stack: Infix, Prefix and Postfix notations- Conversion from Infix to postfix. Queue- Types of queue - Operations on Queue.

MODULE II **LINKED LIST AND ITS OPERATIONS** **9**

Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, Doubly linked list, Circular linked list, Operations on singly linked list: Creation, Insertion, Deletion, Search and Display.

MODULE III **SEARCHING AND SORTING** **9**

Searching - Linear Search Methods - Binary Search Methods, Sorting - Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort.

MODULE IV **TREE AND GRAPH** **9**

Tree - Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and Post order. Graphs, Definition -Breadth-first traversal-Shortest - path algorithms– Minimum Spanning tree– Prim's and Kruskal's algorithms–Depth-first traversal.

MODULE V   ALGORITHM ANALYSIS AND DESIGN   9

Algorithm design techniques: Greedy algorithms, Divide and conquer, Dynamic programming, Backtracking, Branch and bound, Introduction to algorithm analysis: Asymptotic notations, Asymptotic Notations and its properties – Mathematical analysis for Recursive algorithm and Non-recursive algorithms. Time and space complexity of an algorithm.

TOTAL HOURS :45

TEXT BOOKS :

1. Tanenbaum A.S, Langram Y, Augestein M.J, "Data Structures using C" Pearson Education, 2004.

2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill, 1st edition (1 July2017).

REFERENCE BOOKS :

1. Robert Kruse, Data Structures and program designing using 'C' ,3rdedition, 2007.

2. Hanumanthappa M., Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006.

OUTCOMES:

On completion of this course, students will be able to

- Describe how arrays, records, stacks, queues are represented in memory.
- Compare and contrast various sorting and searching techniques
- Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.
- Demonstrate different methods for traversing trees
- Apply suitable shortest path algorithm in appropriate applications

CAD 6125   **OBJECT ORIENTED**   **L   T   P   C**
                    SOFTWARE ENGINEERING

                                                                3   0   0   3

OBJECTIVES:

The objective of this course is to

- Provide basic concepts of software engineering and software life cycle models.
- Explore the techniques for requirement gathering design and specification
- Give an insight into the concepts of modeling and notations of the different UML diagrams.
- Explain the strategies behind designing a project and track progress.
- Provide knowledge on software configuration management.

MODULE I   INTRODUCTION TO SOFTWAREENGINEERING   9

Software engineering concepts - Software engineering development activities - Software life cycle models- Standards for developing life cycle models-Modeling with UML.

MODULE II   REQUIREMENT, PLANNING & SCHEDULING   9

Introduction - Overview of requirements elicitation - Requirement elicitation concepts - Requirement elicitation activities - Managing requirement elicitation - Software Requirements Specification - Software project planning – Scope - Resources - Software Estimation - Empirical Estimation Models – Planning – Risk Management - Software Project Scheduling - Object Oriented Estimation & Scheduling.

MODULE III   ANALYSIS   9

UML: Analysis Modelling - Data Modelling - Functional Modelling & Information Flow - Behavioural Modelling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object oriented Analysis process - Object Relationship Model - Object Behaviour Model. Design modelling with UML.

MODULE IV   OBJECT ORIENTED DESIGN AND INTERFACE   9

Overview of object oriented design-Design Concepts& Principles-Design Process-Modular Design - Design Effective Modularity - Reuse concepts- Reuse Activities-Managing reuse- Overview of interface specification- Interface specification concepts- Interface specification activities- Managing object design.

MODULE V   IMPLEMENTATION AND TESTING   9
**   SOFTWARECONFIGURATION MANAGEMENT**

Overview of mapping- Mapping models to Code- Mapping Object Model to Database Schema- Overview of testing- Testing concepts- Testing activities- Managing testing. Managing and controlling Changes- Managing and controlling versions- Types of maintenance- Maintenance log and defect reports- Reverse and re-engineering.

Total Hours: 45

TEXT BOOKS :

1   Roger. S. Pressman and Bruce R. Maxim, "Software Engineering – A Practitioner's Approach", seventh Edition, McGraw Hill, 2015

2   Ian Sommerville, "Software Engineering", eighth edition, Pearson Education, New Delhi, 2011.

REFERENCE BOOKS :

1   Timothy C. Lethbridge, Robert Laganiere, "Object-Oriented Software Engineering - A practical software development using UML and Java", 3rd Edition, Tata McGraw-Hill, 2006.

2   S.K.Kataria, Rajiv Chopra, "Object Oriented Software Engineering", 3rd Edition,2013.

3   Stephan R. Schach, "Object oriented and classical software engineering", 8th Edition, Tata McGraw Hill, 2010.

4   Bernd Bruegge, "Object oriented software engineering", 3rd Edition, Pearson Education, 2009.

OUTCOMES:

On completion of this course, students will be able to

- Compare the different software life cycle models and select the appropriate model for a real time project.
- Identify the software requirement specification and formulate project planning in real time scenario.
- Analyze different UML concepts and illustrate the UML design for real-time project.
- Execute the object-oriented and software reusability concepts.
- Implement and test software configuration management techniques in software engineering environment.

CAD 6126   **DATA STRUCTURES AND ALGORITHMS**   L   T   P   C
                       USING C/C++LABORATORY

                                                         0   0   2   1

OBJECTIVES:

The objective of this course is to

- Explain various sorting and searching algorithms.
- Explore linear and non linear data structures
- Design and implement algorithms for searching and sorting
- Design and implement operations on stacks, queues, and linked lists
- Introduce the Binary Search Tree implementation using.

LIST OF PROGRAMS

1. Write a C program to create a Stack and do the following operations using arrays and linked lists (i) Push (ii)Pop
2. Create a Queue and do the following operations using arrays and linked lists
    i)   Add (ii) Remove
3. Write a C program to implement doubly linked list
4. Write a C program to sort a list of N elements of integer type using quick sort Algorithm
5. Write a C program to sort a list of N elements using Bubble sort Technique
6. Write a C program to search for an element in an array using Binary search
7. Write a C++ program to implement insertion sort method to sort a given list of integers in descending order.
8. Write a C++ program to implement selection sort method to sort a given list of integers in descending order.
9. Write a C++ program to Create a binary search tree and do the following traversals
    i)In-order (ii) Pre order (iii) Post order .
10. Perform the following operations in a given graph (i)Depth first search (ii) Breadth first search
11. Find the shortest path in a given graph using Dijkstra algorithm.
12. Apply the divide and Conquer technique to arrange a set of numbers

13. Construct optimal binary search trees using dynamic programming method of problem solving.
14. Implement knapsack problem using backtracking
15 Find the solution of traveling salesperson problem using branch and bound Technique.

TOTAL HOURS :30

OUTCOMES:

On completion of this course, students will be able to

- Apply various data structure such as stacks, queues, trees , linked list and graphs to solve various computing problems .

- Choose and implement efficient data structures and apply them to solve problems.

- Implement and analyze various searching techniques and sorting techniques

- Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs

- Develop program that implements kruskal's algorithm, prims, binary search, all types of sorting, greedy algorithm and backtracking technique.

CAD 6127   **PROGRAMMING IN C and**   **L   T   P   C**
                 C++ LABORATORY

                                                0   0   2   1

OBJECTIVES:

The objective of this course is to

- Describe the basic concepts of C constructs.

- Provide knowledge on strings, pointers, functions, structures.

- Explain the necessity of Object-Oriented Programming over Traditional programming.

- Illustrate concepts of Object-Oriented programming language

- Demonstrate the use of file programming.

EXPERIMENTS

C programs

- Programs using I/O statements and expressions.

- Programs using decision-making constructs

- Programs using looping statements (also demonstrate the use of break and continue statements).

- Programs using single dimensional and multi-dimensional arrays.

- Programs using string handling functions.

- Programs using functions and recursive functions.

- Demonstrate the use of structure and Union

- Demonstrate the use of Pointers.

- Demonstrate the use of file handling.

C++ Programs

- Simple Programs using Data Types, Input/output statements and Arithmetic Operators, Conditional statements and different loops

- Programs using structures and functions

- Programs using classes, objects and scope resolution operator

- Programs using Constructors and destructors

- Demonstration of array of object.

- Demonstration using this->pointer.
- Application Programs using Simple, Multiple, Multilevel, Hierarchical and Hybrid Inheritance.
- Demonstration of Virtual function, Friend function and Static function.
- Programs to implement function overloading.
- Programs using operator overloading for Binary, Unary and relational operators.
- Demonstration of pointers to base class and derived class member functions.
- Programs using Function and Class template.
- Program to access a record using file handling.

TOTAL HOURS :30

OUTCOMES

On completion of this course, students will be able to

- Develop C programs for simple applications making use of basic constructs, arrays and strings.
- Develop C programs involving functions, recursion, pointers, and structures.
- Develop C++ programs using Class, Objects, array of object, function overloading, operator overloading.
- Develop C++ programs using the concepts of Object-Oriented Programming features.
- Design applications using sequential and random-access file processing.

CAD 6128   **DBMS LAB**

L	T	P	C
0	0	4	2

OBJECTIVES:

The objective of this course is to

- Learn how to create tables which are fundamental storage blocks of data.
- Learn how to place constraints on data that is entered on tables to ensure data integrity.
- Learn how to add, change and remove data from tables.
- Learn how to select a subset of the data you want to see from the collection of tables and data.
- Learn how to combine table and group multiple rows of data in table.

Experiments

LIST OF PROGRAMS

1. Execute a single line and group functions for actable.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB.
5. Write PL/SQL procedure for an application using exception handling.
6. Write PL/SQL procedure for an application using cursors.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Write a PL/SQL block for transaction operations of a typical application using package.
10. Design and develop an application using any front end and back end tool (make use of ER diagram and DFD)

TOTAL HOURS :60

OUTCOMES:

On completion of this course, students will be able to

- Apply iterative programming at database level.
- Write programming blocks with conditional structure, assignment structure,

loop structure, etc.

- Use exception Handling, Transaction oriented programs, Stored procedures, functions, packages, etc.
- Implement cursors which would allow row wise access of data.
- Use triggers which would allow you define pre and post actions when something change in the database tables.

SEMESTER II

CAD 6221	PROGRAMMING IN JAVA	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objectives of this course is to

- Provide basic understanding of Java fundamentals
- Explore inheritance, interfaces and packages.
- Explain Java programs to perform multi threading and exception Handling
- Familiarize the programming skills to use the object-oriented programming methodology to produce quality computer based solutions to real time problems.
- Introduce collection of AWT packages and develop programs.

MODULE I   JAVA FUNDAMENTALS   9

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Arrays –Constructor.

MODULE II   INHERITANCE AND INTERFACES   9

The Java Class- Inheritance, Derived Classes, Method Over-riding, Method Overloading, Access Modifiers, Abstract Class and Method, Interfaces, Packages, Imports and Class Path.

MODULE III   THREADING AND EXCEPTION HANDLING   9

Threads: Introduction, Creating Threads in Applications-Thread Priority- Exception Handling- Try- Catch Statement, Catching more than one Exception, Generating Exceptions.

MODULE IV   APPLETS AND AWT PACKAGES   9

Create an Applet, Applets Life Cycle, and AWT package – Layouts – Containers – Event Package – Event Model – Painting– Language Packages.

MODULE V   STREAM CLASSES AND I/OPACKAGES   9

Input Stream Classes, Output Stream Classes, File Class. Utility Packages – Input Output Packages – Inner Classes – Java Database Connectivity - Servlets - RMI – Java Beans.

Total Hours: 45

TEXT BOOKS :

1. Herbert Schildt, The Complete Reference – Java 2, 7th Edition, Tata McGraw Hill, 2017.

2. Hortsmann & Cornell, "Core Java Advance Features VOL II", 9th Edition, Pearson Education, 2013.

REFERENCE BOOKS :

1. Keyur shah, "Gateway to Java Programmer Sun Certification", Tata McGraw Hill 2002.

2. Deitel & Deitel, Java How to Program, Prentice Hall 9TH Edition 2011.

OUTCOMES:

On completion of this course, students will be able to

- Write java programs using control structures, arrays and constructors.
- Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- Compare and contrast the interfaces and abstract classes.
- Handle the exceptions effectively and illustrate the life cycle of thread.
- Create solutions for real time problems using AWT packages, servlets and java beans.

CAD 6222   RESOURCE MANAGEMENT TECHNIQUES

	L	T	P	C
	3	1	0	4

OBJECTIVES:

The objective of this course is to :

- Explain mathematical model of linear programming problems
- Illustrate mathematical model of Transportation problems
- Familiarize the mathematical model of Assignment problems
- Explore network modeling for planning and scheduling the project activities
- Demonstrate Queuing Models to minimize waiting time in the queue.

MODULE I   LINEAR PROGRAMMING MODELS   12

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques-Variants.

MODULE II   TRANSPORTATION AND ASSIGNMENT MODELS   12

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – Optimum solution - Degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm

MODULE III   INTEGER PROGRAMMING MODELS   12

Formulation – Gomory's IPP method – Gomory's mixed integer method – Branch and bound technique.

MODULE IV   PROJECT SCHEDULING BY PERT AND CPM   12

Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling.

MODULE V   QUEUING MODELS   12

Characteristics of Queuing Models–Poisson Queues-(M/M/1):(FIFO/∞/∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO/N / 8) models.

Total Hours: 60

TEXT BOOKS :

1. Taha H.A., "Operations Research : An Introduction " 8th Edition, Pearson Education, 2008

REFERENCE BOOKS :

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia, 2005

2. Gross, D. and Harris, C.M., "Fundamentals of Queueing Theory", Wiley Student, 3rd Edition, New Jersy, 2004

3. N. D Vohra, Quantitative Techniques in Management, Tata Mcgraw Hill, 2010

4. Prem Kumar Gupta, D.S. Hira, "Operations Research", S. Chand & Company Ltd, New Delhi, 3rd Edition , 2008

OUTCOMES:

On completion of this course, students will be able to

- Apply linear, integer programming to solve operational problem with constraints
- Solve transportation and assignment models to find optimal solution in warehousing and Travelling Problems
- Prepare project scheduling using PERT and CPM
- Identify and analyze appropriate queuing model to reduce the waiting time in queue
- Solve optimization concepts in real world problems

CAD 6223	**CLOUD COMPUTING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

The objective of this course is to

- Explain the concept of cloud computing.
- Explore about various cloud services from different service providers.
- Illustrate the virtualization concepts in cloud environment
- Expose various ways to collaborate the cloud service online.
- Explore the different online tools available in cloud environment.

MODULE I   INTRODUCTION   9

Introduction to Cloud Computing : Cloud Computing in a Nutshell – Roots of Cloud Computing – Layers and Types of Cloud Computing – Cloud Infrastructure Management – Migration to Cloud Environment : Approaches – The Seven Step Model for Migration

MODULE II   CLOUD EVOLUTION AND SERVICES   9

Evolution of Cloud Computing : Hardware Evolution – Internet Software Evolution – Server Virtualization – Web Services Delivered from the Cloud : Communication as a Service (CaaS) – Infrastructure as a Service (IaaS) – Platform as a Service (PaaS) – Software as a Service (SaaS) - Cloud Deployment Models : private – public – hybrid – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.

MODULE III   VIRTUALIZATION   9

Level of Virtualization – Virtualization Structure / Tools and Mechanism – Virtualization of CPU – Memory – I / O Devices – Virtual Clusters and Resource Management – Virtualization for Data Centre Automation

MODULE IV   APPLICATIONS USING CLOUD SERVICES   9

Application - Calendars, Schedules and Task Management – Exploring Online Scheduling - Applications – Exploring Online Planning and Task Management – Event Management – Contact Management– Project Management – Databases – Storing and Sharing Files.

MODULE V   COLLABORATION   9

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis – Case Study

Total Hours: 45

TEXT BOOKS :

1   Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing Principles Books and Paradigms, Wiley, 2010

2   Ritting house, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security‖, CRC Press, 2017.

REFERENCE BOOKS :

1   Kumar Saurabh, "Cloud Computing – Insights into New Era Infrastructure", Wiley Indian Edition, 2011.

2   Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On- demand Computing, Applications and Data Centres in the Cloud with SLAs, Emereo Pty Limited, July 2008.

3   Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan

Kaufmann Publishers, 2012.

4   Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

OUTCOMES:

On completion of this course, students will be able to

- Apply the systems, protocols to support cloud computing.
- Identify the architecture and infrastructure of cloud computing.
- Design applications by integrating cloud services.
- Use the web based tools available in cloud.
- Collaborate using online cloud based tools.

CAD 6224   MOBILE APPLICATION DEVELOPMENT   **L   T   P   C**

                                                                                        3   0   0   3

OBJECTIVES:

The objective of this course is to :

- Give an overview on different mobile development environment.
- Gain basic understanding of Android application development.
- Impart knowledge on how to build an Android application
- Understand the IOS development environment
- Provide knowledge on how to build an iOS application

MODULE I   INTRODUCTIONTO MOBILE APPLICATION DEVELOPMENT   9

Introduction to mobile applications-Differences between mobile applications and desktop applications-App store, Google Play, Windows Store-Hybrid Mobile App Development-Phone GAP-Ionic Framework.

MODULE II   ANDROID FRAMEWORK   9

Introduction to Android-Brief history-Features of Android-The Android Platform - Android SDK - Anatomy of an Android Application-Creating Android Virtual Devices-Manifest file - Activity - Services-Content Provider-Broadcast Receiver-Intents - SQLite Databases

MODULE III   USER INTERFACE DESIGN   9

Android User Interface Design Elements-Views: Button, Text Field, Radio Button, Toggle Button, Checkbox, Spinner -View Groups-Android Layout Managers-- List View- Grid View-Table View- Web View- Adapters-Menus, Action Bars, Notifications: Status, Toasts and Dialogs, Styles Themes-Drawing and Working with Animation-Android Media API: Playing audio/video, Media recording. Sensors - Maps & Location

MODULE IV   IOS DEVELOPMENT FUNDAMENTALS   9

iOS Basics - iOS Architecture - Integrated development Tools – Introduction to XCode, Swift - Frame work and Libraries - Project templates - Resource & Application Settings - Views & Controls - Debugging & Running - Building Block Approach - Application Life cycle - MVC – Pattern – View

MODULE V   ADVANCED CONCEPTS IN IOS   9

Data Management - Core Data - Application Storage - External Storage - Memory Management - Leaks and Allocations - UI Design - Design Tools - Interface Builders - Story board - View Controllers - Drawing model – Windows - Event Handling - View data Source and delegates - Multimedia and Networks - Library - Location Services - Google Maps - Apple Push and Local Notifications - Accelerometer.

TEXT BOOKS :
 1   Head First Android Development –Dawn Griffiths &David Griffiehts, Second Edition,2017-O'Reilly Publication
 2   IOS 13 Programming for Beginners-Fourth Edition, Ahmad Sahar, Packt Publisheing-2020

REFERENCE BOOKS :
 1   Professional Android 4 Application Development-RetoMeier, Third Edition,2012-Wrox Publications
 2   "Beginning iOS 6 Development: Exploring the iOS SDK", David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Apress, 2013.

OUTCOMES:
On completion of this course, students will be able to
 • Describe the requirements for mobile applications
 • Explain the architecture and building blocks of Android
 • Develop and design mobile applications using Android for specific requirements
 • Explain the architecture and building blocks of iOS
 • Develop and design mobile applications using iOS for specific requirements

CAD 6225   **INTRODUCTION TO DATA SCIENCE**   **L   T   P   C**
                                                       3   0   0   3

OBJECTIVES:

The objective of this course is to

- Explain fundamentals of data science and statistical modelling techniques.
- Describe proficiency with statistical analysis of data.
- Demonstrate on mathematical tools for data science.
- Familiarize on machine learning algorithms for predictive modelling.
- Expose to different data visualization tools and techniques.

MODULE I   INTRODUCTION   9

Introduction: Data Science - Big Data and Data Science hype –Datafication - Current landscape of perspectives - Skill sets needed. Statistical Inference - Populations and samples - Statistical modelling, probability distributions, fitting a model.

MODULE II   EXPLORATORY DATA ANALYSIS   9

Exploratory Data Analysis - Getting and Cleaning data Statistical Inferences - Summarizing and Visualizing the Data

MODULE III   MATHS FOR DATA SCIENCE   9

Mathematics for Data Science - Statistics Inferences and Probability – Linear Algebra

MODULE IV   MACHINE LEARNING   9

Machine Learning in Data Science Supervised, unsupervised, reinforcement and deep learning, Naive Bayesian Algorithm, K means, K nearest Neighbour hood Algorithms

MODULE V   DATA VISUALIZATION   9

Data Visualization - Basic principles, ideas and tools for data visualization. Examples of inspiring (industry) projects. creation of own visualization of a complex dataset. Data Science and Ethical Issues - Discussions on privacy, security, ethics.

Total Hours: 45

TEXT BOOKS :

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)

REFERENCE BOOKS :

1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.

2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)

OUTCOMES:

On completion of this course, students will be able to

- Describe the Data Science Process and how its components interact.
- Explain the significance of exploratory data analysis (EDA) in data science.
- Apply basic tools (plots, graphs, summary statistics) to carry out EDA.
- Analyze the different basic machine learning algorithms (Linear Regression, k-Nearest Neighbours (k-NN), k-means, Naive Bayes) for predictive modelling.
- Create effective visualization of given data (to communicate or persuade).

CAD 6226   **COMMUNICATIONSKILLS LABORATORY**   L   T   P   C
                                                           0   0   2   1

OBJECTIVES:

The objective of this course is:

- To enhance the ability of students in Learning, Speaking, Reading, Writing (LSRW) skills.
- To develop their speaking skills to interact efficiently in real life situations and in workplace
- To impart listening and reading techniques for better communication
- To improve the writing skills of students through reports, letterset.

MODULE I   **FUNDAMENTALS OF LANGUAGE**   **3**

Tenses, Subject – Verb Agreement, Correction of Errors

MODULE II   **ORAL COMMUNICATION**   **15**

Introducing oneself, Conversations, Role-play - Activities based on real life situations and professional situations such as marketing, advertising, etc. Debating on a topic, Group Discussion, Oral Presentation, Non-verbal communication, Mock Interviews, Phonetics- Correct Pronunciation

MODULE III   **WRITTEN COMMUNICATION**   **6**

Writing a letter of application with résumé - calling for quotations – placing an order – letter of complaint, Memoranda, Writing an email, Report Writing - Project report

MODULE IV   **LISTENING AND READING**   **6**

Language fundamental practices - Listening Comprehension, Reading Comprehension, Listening to correct pronunciation, Accent, Viewing models of Presentations, Interviews.

                                            Total Hours:30

REFERENCES :

1. A.J.Thomson& A.V. Martinet, "A Practical English Grammar" Oxford University Press, 1999.

2. Andrea J. Rutherford, "Basic Communication Skills for Technology", second edition, Pearson Education, 2007

3. P.K.Dutt, G. Rajeevan and C.L.N. Prakash, "A Course in Communication Skills", Cambridge University Press, India 2007

4. Krishna Mohan and Meera Banerjee, "Developing Communication Skills", Macmillan India Ltd. (reprinted 1994-2007).

5. Riordan, Pauley, "Report Writing Today", AIT B.S. Publisher, New Delhi (2000).

6. Gerson, Sharon, Steve m. Gerson, "Technical Writing: Process and Product", Pearson Education, New Delhi (2004).

7. R.K. Bansal, J.P. Harrison, "Spoken English", Orient Longman, Mumbai (1999)

8. Grant Taylor, "English Conversation Practice" Tata MC Graw Hill, New Delhi (1997).

OUTCOMES:

On completion of this course, students will be able to

- Demonstrate the efficacy of their reading and listening skills

- Speak fluently on various topics

- Participate effectively in debates and discussions

- Write professional documents like reports, letters and proposals efficiently

- Communicate clearly using appropriate vocabulary and grammatically correct expressions.

CAD 6227 **ADVANCED TECHNOLOGY LABORATORY** L T P C
            (Cloud/Mobile/Data Science)   0 0 2 1

OBJECTIVES:

The objective of this course is to

- Explain the fundamental concepts of cloud computing.
- Explore the services and security concepts in cloud environment.
- Describe the components and structure of a mobile development frameworks (Android SDK and Eclipse Android Development Tools (ADT)) and learn how
  and when to apply the different components to develop a working system.
- Demonstrate the basic concepts of Reprogramming
- Illustrate Data Science applications using Reprogramming

CLOUD COMPUTING

1. Create NFS & VMFS Data store in the v-Sphere Web Client.
2. Implementation of Load Balancing in AWS.
3. Manage Hosts on a v-Sphere Distributed Switch in the v-Sphere Web Client.
4. Study and implementation of Infrastructure as eservice.
5. Study and implementation of Storage as a Service.
6. Study and implementation of Cloud Security management.

MOBILE APPLICATION DEVELOPMENT

1. Develop an application that uses GUI components, Fonts and colors.
2. Develop an application that uses layout managers and event listeners.
3. Develop a native calculator application.
4. Develop an application that draws basic graphical primitives on the screen.
5. Develop an application that creates an alarm clock.

DATA SCIENCE USING R PROGRAMMING

1. Programs using basic data types
2. Programs using Arrays.

3. Programs using Matrix.
4. Programs using Vector
5. Programs using Functions.
6. Programs using Data frame.
7. Programs using List and Factors.
8. Programs using loops.
9. Programs using Plots and tabulation.

Total Hours: 30

OUTCOMES:

On completion of this course, students will be able to

- Implement the cloud services in real-time scenario.
- Deploy cloud computing technologies to analyze the security management in real time projects.
- Develop and deploy mobile applications for the Android operating system using basic and advanced phone features
- Implement basic R programming concepts.
- Analyze and plot graph for various data science applications.

CAD 6228   **PROGAMMING IN JAVA LABORATORY**   **L   T   P   C**
                                                  0   0   2   1

OBJECTIVES:

The objectives of this course is to

- Explain object-oriented programming techniques.

- Provide quality based software solutions to real problems.

- Familiarize the advance features of java technology.

- Demonstrate the use of application programming interface (api) and develop programs

- Illustrate multithreaded programs with exception handling mechanism.

JAVA PROGRAMMING:

1. Program to implement various looping structures and arrays.
2. Program to illustrate the use of overloading and overriding.
3. Program to implement the concept of inheritance.
4. Program to illustrate the use of multi-threading.
5. Program to implement the concept of Interfaces and packages.
6. Generate the program using exceptions handling mechanism.
7. Implement the file operations.
8. Implement i/o stream classes
9. Program using Applets.
10. Program to handle Mouse Events, Keyboard Events and work with GUI Components.
11. Program using JDBC.

Total Hours: 30

OUTCOMES:

On completion of this course, students will be able to

- Apply basic control structures, arrays, looping statement and various class libraries in developing program.

- Write java programs using object-oriented programming techniques inheritance, polymorphism, interface, constructors and abstract class.

- Create package for real time applications like bank transaction, employee processing etc.

- Construct multithreaded programs and handle exceptions.

- Develop programs using Applets.

ELECTIVE I - SEMESTER II

CADY251   **DIGITAL MARKETING**   **L**   **T**   **P**   **C**

                                                        3   **0**   **0**   **3**

OBJECTIVES:

The objective of this course is to

- Explain a systematic approach to develop a Digital Marketing strategy

- Familiarize online marketing strategy integrated with overall marketing Objectives

- Explore email marketing as an effective marketing channel

- Expose all the essentials of mobile marketing

- Explore various strategic building process in digital marketing

MODULE I   DIGITAL MARKETING BASICS   9

Introduction to marketing-digital marketing and its principles-digital marketing wins over traditional marketing- CPR, CPM, PPC, CPC, SEO, SEM-UNDERSTANDING various Social channels- Digital Marketing Process-Increasing Visibility- Visitors Engagement-- Bringing Targeted Traffic- Converting Traffic into Leads- Retention - Performance Evaluation.

MODULE II   BUILDING WEBSITE AND SEARCH ENGINE   9
                     OPTIMIZATION

Internet- web – websites-domain names-web server- web hosting- Planning and conceptualizing a website- Building website using CMS in class-SEO-SERP-Google Keyword Planner tool- Google Operator- Content optimization & planning-On page Optimization- Off page Optimization-Local SEO- Google Webmaster Tools

MODULE III   ONLINE DISPLAY ADVERTISING AND ECOMMERCE   9
                     MARKETING

Online advertising-display advertising- Banner ads- Rich Media ads- Pop ups and Pop under ads- Contextual advertising- Payment Modules- Online advertising platforms- Ecommerce- Top Ecommerce websites- Ecommerce scenario in India-marketing strategy- Mobile Marketing and Social Media- Using tools to create mobile websites- Content Marketing on mobile- SMS marketing-Uploading mobile app in Android and Ios

MODULE IV   CONTENT MARKETING   9

Content Marketing- steps in strategy building process- Optimizing content for search engines- authority blog- monetizing authority blog- unique ways to write magnetic headlines- Case study on content marketing.

MODULE V   ONLINE REPUTATION MANAGEMENT   9

Online reputation management- ORM scenario- Online reputation management Commandments- positive brand image online- tools for monitoring online reputation -overcome negative online reputation-Case Study

Total Hours: 45

TEXT BOOKS :

1   Alan Charlesworth, "Digital Marketing: A Practical Approach", Routledge Publication, 2nd Edition,2014

2   "Digital Marketers Sound Off: Tips, Tactics, Tools, and Predictions", Matt Chiera, 2018

REFERENCE BOOKS :

1   Dave Chaffey Et Al E marketing Excellence: Planning and Optimizing your digital marketing , Third Edition, 2008

OUTCOMES:

On completion of this course, students will be able to

- List the advantages of digital marketing over traditional marketing.
- Summarize how they can use digital marketing is used to increase sales and grow their business
- Analyze digital marketing toolkit
- Familiarize elements of the digital marketing plan
- Develop online target market and basic digital marketing objectives

CADY252   MANAGEMENT INFORMATION SYSTEMS   L   T   P   C
                                                  3   0   0   3

OBJECTIVES:

The objective of this course is to

- Explain the basic principles of Computer based Information System support the management in the various arena in the business units.

- Give an insight into the various organizational structures, culture and power.

- Provide an understanding of the Information Systems(IS) management framework of E-business. To focus on best practices, tools and models to implement an effective management system.

- Provide insights on the development and implementation of enterprise-wide IT strategies, initiatives and programs.

- Explore MIS subsystems and technologies including hardware, software and networking.

MODULE I   SYSTEM CONCEPTS   9

Definition – Computer based user machine system – Integrated system – Need for a database – Utilization of models – Evolution – Subsystems – Organizational subsystems – Activities subsystems.

MODULE II   ORGANIZATIONAL STRUCTURE   9

Basic model – Hierarchical – Specialization – Formalization – Centralization – Modifications of basic organizational structure – Project organization – Lateral relations – Matrix organization – Organizational culture and power organizational change.

MODULE III   STRUCTURE OF MIS   9

Operating elements – Physical components – Processing functions – outputs– MIS support for decision making – Structured programmable decisions – Unstructured non-programmable decisions – MIS structure based on management activity and organizational functions – Synthesis of MIS structure

MODULE IV   SYSTEM SUPPORT   9

Data representation – Communication network – Distributed systems – Logical data concepts – Physical storage devices – File organizations – Data base

MODULE V   DEVELOPMENT AND MANAGEMENT   9

A contingency approach to choosing an application – Developing strategy – Lifecycle definition stage – Lifecycle development stage – Lifecycle installation and operation stage – Project management

Total Hours: 45

TEXT BOOKS :

1   James A, O'Brien, George M. Marakas , Ramesh Behl, "Management Information Systems", 10th Edition, Mcgraw Hill, 2017.

2   Harold Koontz, Heinz Weihrich, "Essentials of Management", 5th Edition, Tata McGraw Hill 1998.

REFERENCE BOOKS :

1   E.Wainright Martin, Carol V. Brown, Danial W. DeHayes, Jeffrey A. Hoffer, William C. Perkins, "Managing Information Technology" 3rd Edition, Prentice Hall International edition 1999.

OUTCOMES:

On completion of this course, students will be able to

- Describe the various components of Computer based Information system suitable for the business organization.
- Compare, contrast, and choose appropriate hardware, software, database and networking suitable for the organizational Information system.
- Distinguish and analyze ethical problems that occur in business and society
- Apply leadership skills and competencies in business situations
- Illustrate how current technologies and decision-support tools can be utilized to the advantage of business operations.

CADY253   **MULTIMEDIA SYSTEMS AND**   **L T P C**
                        COMPUTER GRAPHICS

                                                         3 0 0 3

OBJECTIVES:

The objective of this course is to

- Explain the basic concept of multimedia and its hardware /Software
- Explore the various multimedia tools and its usage
- Familiarize the importance of internet in multimedia applications
- Introduce basic graphics and design algorithms
- Illustrate the concept of 2D and 3Dtransformation

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

Definition - CD-ROM and multimedia-Multimedia applications: business - schools - Homes - public places and virtual reality. Introduction to making of multimedia: hardware - software - creativity - and organization.

MODULE II   **MULTIMEDIA TOOLS**   **9**

Macintosh and windows production platforms - 3-d modelling and animation - image- editing tools - sound editing tools - animation - video - and digital movie tools - linking multimedia objects - office suites - word processors - spread sheets - databases - presentation tools. Authoring tools - Card and Page-based authoring tools - Icon Based authoring tools - time based authoring tools - object oriented authoring tools - cross platform-authoring tools

MODULE III   **MULTIMEDIA AND THE INTERNET**   **9**

Internet fundamentals: Internetworking – Connections – Internet services – The World Wide Web – Tools for the World Wide Web: Web serves – Web browsers – Web page makers and Site builders – Plug-ins and Delivery vehicles – Beyond HTML

MODULE IV   **GRAPHICS PRIMITIVES**   **9**

Introduction Overview of Graphics System – Bresenham technique – Line Drawing and Circle Drawing Algorithms – DDA – Line Clipping – Text Clipping.

MODULE V   2D AND 3D TRANSFORMATIONS   9

Two dimensional transformations – Scaling and Rotations – Interactive Input methods – Polygons – Splines – Bezier Curves Window view port mapping transformation – 3D Concepts – Projections.

Total Hours: 45

TEXT BOOKS :

1 Tay Vaughan," Multimedia: Making It Work", 8thEdition , 2011, McGraw-Hill (Unit 1, Unit 2 and Unit 3)

2 Hearn D and Baker M.P, "Computer graphics – C Version", 2nd Edition, Pearson Education, 2004 (Unit 4 and 5)

REFERENCE BOOKS :

1 K. Andleigh and K. Thakkrar , "Multimedia System Design", 1996, Prentice Hall PTR

2 Steve Rimmer, "Advanced multimedia programming", Windcrest /McGraw-Hill, 1995

OUTCOMES:

On completion of this course, students will be able to

- Analyze the technical aspect of Multimedia Systems.
- Develop various Multimedia Systems application for real time scenario.
- Apply various networking protocols for multimedia applications.
- Evaluate multimedia application for its optimum performance.
- Create a multimedia component using various tools and techniques.