Regulations 2019
Curriculum and Syllabi

(Amendments updated upto June 2020)

M.C.A
(Master of Computer Applications)
REGULATIONS 2019

CURRICULUM AND SYLLABI

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) are listed below:

PEO-1: To provide students with a solid foundation in mathematics and computing fundamentals required to analyze and solve computing problems and also to pursue research and higher studies.

PEO-2: To provide technical knowledge in various programming languages and train them to comprehend, analyze, 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 moulds the students to become professionally enriched with communication, technical and innovative skills to meet the dynamic needs of industry and society.
PROGRAM OUTCOMES

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

PSO1: To enrich the graduates with necessary design and development skills for real-time/industry or research projects using cloud computing/mobile applications/Data analytics technologies with vertical specialization.

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

<table>
<thead>
<tr>
<th>Degree</th>
<th>Mode of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Tech.</td>
<td>Full Time</td>
</tr>
<tr>
<td>MCA</td>
<td></td>
</tr>
<tr>
<td>M.Sc.</td>
<td></td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Min. No. of Semesters</th>
<th>Max. No. of Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Tech.</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>MCA (3 years)</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>MCA (Lateral Entry)</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>MCA (2 years)</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Department</th>
<th>Programmes offered</th>
<th>Qualifications for admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Civil Engineering</td>
<td>M. Tech. (Structural Engineering)</td>
<td>B.E. / B. Tech. (Civil Engineering) / (Structural Engineering)</td>
</tr>
<tr>
<td></td>
<td>M.C.A</td>
<td>Computer Applications</td>
<td>Regulations 2019</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>M. Tech. (Manufacturing Engineering)</td>
<td>B.E. / B. Tech. (Mechanical / Automobile / Manufacturing / Production / Industrial / Mechatronics / Metallurgy / Aerospace / Aeronautical / Material Science / Marine Engineering)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M. Tech. (CAD/CAM)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M. Tech. (Power Electronics and Drives)</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Computer Applications</td>
<td>MCA (3 years)</td>
<td>Bachelor Degree in any discipline with Mathematics as one of the subjects (or) Mathematics at +2 level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCA – (Lateral Entry)</td>
<td>B.Sc. Computer Science / B.Sc. Information Technology / BCA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCA (2 years)</td>
<td>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</td>
</tr>
<tr>
<td>10.</td>
<td>Mathematics</td>
<td>M.Sc. (Actuarial Science)</td>
<td>Any Degree with Mathematics / Statistics as one of the subjects of study</td>
</tr>
<tr>
<td>12.</td>
<td>Chemistry</td>
<td>M.Sc. (Chemistry)</td>
<td>B.Sc. (Chemistry / Applied Science)</td>
</tr>
<tr>
<td>13.</td>
<td>Life Sciences</td>
<td>M.Sc. Molecular Biology &amp; Biochemistry</td>
<td>B.Sc. in any branch of Life Sciences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M.Sc. Biotechnology</td>
<td>B.Sc. in any branch of Life Sciences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M.Sc. Microbiology</td>
<td>B.Sc. in any branch of Life Sciences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M.Tech. Biotechnology</td>
<td>B.Tech. (Biotechnology / Chemical Engineering) / M.Sc. in any branch of Life Sciences</td>
</tr>
</tbody>
</table>

### 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:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Range of credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Tech.</td>
<td>74 - 80</td>
</tr>
<tr>
<td>MCA (3 years)</td>
<td>118 - 126</td>
</tr>
<tr>
<td>MCA (Lateral Entry)</td>
<td>80 - 85</td>
</tr>
<tr>
<td>MCA (2 years)</td>
<td>85 - 90</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>77 - 82</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Programme</th>
<th>Non-project semester</th>
<th>Project semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Tech.</td>
<td>9 to 28</td>
<td>18 to 26</td>
</tr>
<tr>
<td>MCA</td>
<td>12 to 33</td>
<td>12 to 26</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>9 to 32</td>
<td>10 to 26</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Minimum no. of credits to be earned to enroll for project semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Tech.</td>
<td>18</td>
</tr>
<tr>
<td>MCA (3 years)</td>
<td>45</td>
</tr>
<tr>
<td>MCA (Lateral Entry)</td>
<td>22</td>
</tr>
<tr>
<td>MCA (2 years)</td>
<td>22</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>18</td>
</tr>
</tbody>
</table>

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 than 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:

<table>
<thead>
<tr>
<th>Assessments</th>
<th>Weightage of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Assessment 1</td>
<td>25%</td>
</tr>
<tr>
<td>Continuous Assessment 2</td>
<td>25%</td>
</tr>
<tr>
<td>Semester End Examination</td>
<td>50%</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
</tr>
<tr>
<td>U</td>
<td>0</td>
</tr>
<tr>
<td>W</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
</tr>
<tr>
<td>AB</td>
<td>0</td>
</tr>
</tbody>
</table>

"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 \( i \)th course and \( GP_i \) is the Grade Point in the \( i \)th course,

\[
GPA = \frac{\sum_{i=1}^{n} (C_i)(GP_i)}{\sum_{i=1}^{n} C_i}
\]
Where \( n \) = number of courses

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

\[
\text{Percentage Equivalent of Marks} = \text{CGPA} \times 10
\]

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:

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

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

Notwithstanding all that have been stated above, the Academic Council has the right to modify any of the above regulations from time to time.

***************
### CURRICULUM & SYLLABI FOR
MASTER OF COMPUTER APPLICATIONS
(SIX SEMESTERS / FULL TIME)

#### CURRICULUM

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B.S. Abdur Rahman Crescent Institute of Science and Technology | 26
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**Total Credits = 124**
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SEMESTER I

MAD 6186 DISCRETE MATHEMATICS

OBJECTIVES:

- To acquire knowledge on Set theory, Logical connectives and normal forms.
- To familiarize students with applications of Formal language and Algebraic Theory to Computer Science problems.
- To compute problems on Permutations and Combinations, Algebraic structures, logical connectives, truth tables, normal forms.
- To analyze and derive conclusion on Proofs by contradiction, kernel of homomorphism, Cosets and Lagrange’s theorem, Normal subgroups, Rings and Fields.

MODULE I FUNDAMENTAL STRUCTURES


MODULE II LOGIC

Prepositional, logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) - Predicate logic - Universal and existential quantifiers - Proof techniques – direct and indirect – Proof by contradiction – Mathematical Induction.

MODULE III COMBINATORICS

Basics of counting – Counting arguments – Pigeonhole principle - Permutations and Combinations - Recursion and Recurrence relations – Generating functions.

MODULE IV ALGEBRAIC STRUCTURES

MODULE V  MORPHISMS ON ALGEBRAIC STRUCTURES  12
Morphisms of groups – kernel of homomorphism - Cosets and Lagrange’s theorem – Normal subgroups – Rings and Fields.

Total Hours: 60

TEXT BOOKS AND REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Model physical problems to mathematical problems
- Solve modelled problems using set theory, connectives and Permutation and combinations.
- Critique solution derived using proofs by contradictions, homomorphism’s and groups, Normal subgroups, Rings and Fields.
- Construct, organize and conclude problems on algebraic structures, logical connectives, and normal forms.
- Apply the acquired knowledge to solve problems on Finite state machines, deterministic and Non-deterministic finite state, Formal Languages, Classes of Grammars
OBJECTIVES:
- To gain experience about structured programming and various features of C
- To develop the programming ability in students using the programming constructs Loop, functions, arrays, structures and unions.
- To identify and practice the object-oriented programming concepts and techniques
- To practice the use of C++ classes and class libraries
- To develop applications using Object Oriented Programming concepts

MODULE I INTRODUCTION TO C LANGUAGE

MODULE II ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS
Arrays – dynamic and multi-dimensional arrays - Character arrays and Strings – String handling Functions - User defined Functions – Categories of Functions – Recursion - Structures and Unions – Array of Structures – Structures and Functions.

MODULE III POINTERS AND FILE MANAGEMENT
Pointers – Declaration, Accessing a variable, character strings, pointers to functions and structures - File Management in C – Dynamic Memory allocation.

MODULE IV OBJECT ORIENTED CONCEPTS
Overview of C++ - Classes and Objects - Friend Functions - Friend Classes -Inline Functions - Static Members – Arrays – Pointers – References - Dynamic Allocation.

MODULE V INHERITANCE AND EXCEPTION HANDLING
Operator Overloading-Member Operator Overloading-Overloading new and delete-Inheritance-Base Class-Access Control-Virtual Functions-Pure Virtual Functions-Templates-Generic Functions-Applying Generic Functions-Generic Classes-Exception Handling-C++ I/O Streams-File I/O
Total Hours: 60

TEXT BOOKS:
1. R.G.Dromey, “How to Solve it by Computer”, PHI, 1998

OUTCOMES:
On completion of this course, students will be able to
- Design, implement, test and debug programs using different data types, arrays, decision making statement and loops.
- Solve simple, moderate, mathematical, logical and business problems in ‘C’.
- Differentiate structure and union in the aspect of memory management.
- LIST the features of object-oriented programming language
- Apply various object-oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using C++ language.
OBJECTIVES

- To impart the knowledge in the field of digital electronics
- To impart knowledge about the various components of a computer and its internals.
- To enrich knowledge on input and output organization of a computer.
- To learn the functions and services of different types of memory system.
- To understand the functions of basic processing unit.

MODULE I   LOGIC CIRCUITS  09

MODULE II   MACHINE INSTRUCTIONS AND PROGRAMS  09

MODULE III   INPUT / OUTPUT ORGANIZATION  09

MODULE IV   MEMORY SYSTEM  09
operand multiplication – fast multiplication – integer division – floating point numbers and operations.

MODULE V  BASIC PROCESSING UNIT


Total Hours: 45

TEXT BOOKS:

REFERENCE BOOKS:

OUTCOMES:
On completion of this course, students will be able to

- Solve basic binary math operations using the computer.
- Demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target computer.
- Apply knowledge of the processor’s internal registers and operations by use of a PC based microprocessor simulator.
- Write assembly language programs and run their program on the training boards.
- Design electrical circuitry to the processor I/O ports in order to interface the processor to external devices.
- Write assembly language programs and download the machine code that will provide solutions to the real-world control problems.
CAD 6103 DATABASE MANAGEMENT SYSTEMS L T P C 3 0 0 3

OBJECTIVES:
- To provide an introduction on database and its operations.
- To understand the fundamentals of relational systems including data models, database architectures and database manipulations.
- To teach how to construct simple and moderately advanced database queries using structured Query Language.
- To teach the concept of a database transaction, handling deadlocks, paging, concurrency control, backup and recovery systems.
- To explore the origins of NoSQL databases and the characteristics that distinguishes them from traditional relational database management systems.

MODULE I INTRODUCTION 09

MODULE II RELATIONAL DATABASES 09
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 DATA STORAGE AND INDEXING 09

MODULE IV QUERY EVALUATION & OPTIMIZATION 09

MODULE V TRANSACTION MANAGEMENT 09
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 BOOK:**


**REFERENCES:**


**OUTCOMES:**

On completion of this course, students will be able to

- Describe the concepts of data storage and indexing, transaction management, query evaluations and optimization techniques.
- List the importance of DBMS and differentiate how DBMS is better than traditional File Processing Systems.
- Analyze the basic structure of Database and recognize the different views of the database.
- Formulate data retrieval queries in SQL for real time scenario.
- Construct and normalize conceptual data models
- Handle the deadlocks that occur in the system.
- List the differences between a relational database and a non-relational (NoSQL) database
OBJECTIVES:
- To provide students with enough knowledge in networking, various types of networks and its applications.
- To describe the issues of data link protocols including encoding, framing, and error detection.
- To learn various switching and routing techniques
- To acquire essential knowledge about layer architecture of data communication.
- To learn the technologies of Software Defined Networking (SDN), Network Functions Virtualization (NFV)

MODULE I  INTRODUCTION

MODULE II  NETWORK FUNDAMENTALS

MODULE III  NETWORK LAYER

MODULE IV  TRANSPORT LAYER
Reliable Byte Stream (TCP) – Simple Demultiplexer (UDP) – TCP Congestion Control – Congestion Avoidance Mechanisms.

MODULE V  PRESENTATION LAYER and APPLICATIONS
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 BOOK:

REFERENCES:

OUTCOMES:
At the end of the course, the students will be able to
- Identify and describe the layers of the OSI and TCP/IP.
- List the applications of network
- Make effective use of networking topologies
- Illustrate how networks work in practice
- Identify the requirements for different network architecture
- Evaluate the performance of each of the protocols.
- Summarize the features of an emerging paradigm software defined networking (SDN) in computer networking.
OBJECTIVES:
- Brief on Data Types, Operators, Statements, Loops, Functions, Array, Pointers, Structures.
- Make the students write programs using various programming constructs.
- Understand and solve logical & mathematical problems through C++ language.
- Design and develop solutions to intermediate level problems.
- Develop their skills in software development using a procedural language.
- Get programming skill in object-oriented technology with the usage of C++.

LIST OF PROGRAMS
1. Display the following:
   i. Floyd's triangle
   ii. Pascal Triangle
2. Generate the following series of numbers:
   i. armstrong numbers between 1 to 100
   ii. prime numbers between 1 to 50
   iii. Fibonacci series up to N numbers
3. Manipulate the strings with following operations.
   i. Concatenating two strings
   ii. Reversing the string
   iii. Finding the substring
   iv. Replacing a string
   v. Finding length of the string
4. Find the summation of the following series:
   i. Sine
   ii. Cosine
   iii. Exponential
5. Create the sales report for M sales person and N products using two dimensional array.
6. Simulate following Banking operations using functions.
   a. Deposit
   b. Withdrawal
   c. Balance Enquiry
7. Implement using recursion
a. Find the solution of Towers of Hanoi problem using recursion.
b. Fibonacci number generation.
c. Factorial

8. Generate Student mark sheets using structures.

9. Create a collection of books using arrays of structures and do the following:
   a. Search a book with title and author name
   b. Sorts the books on title.

10. Programs using Constructor and Destructor.

11. Creation of classes and use of different types of functions.

12. Count the number of objects created for a class using static member function.

13. Write programs using function overloading and operator overloading.

14. Programs using inheritance.

15. Program using Friend function.


17. Write a program using exception handling mechanism.

18. Programs using files.

19. Programs using function templates.

Total Hours: 60

OUTCOMES:
On completion of this course, students will be able to

- Design and debug programs involving different data types, decision structures and loops.
- Apply the in-built functions and customized functions for solving the problems.
- Handle the exceptions that raise in the program.
- Write, read and manipulate the data stored in files to deal with various real time problems
- Work in a team to analyze engineering problems and develop C++ programs for solving these problems.
- Reuse the code and write the classes which work like built-in types
OBJECTIVES:

- 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.

LIST OF PROGRAMS

1. Execute a single line and group functions for a table.
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).

Typical Applications – Banking, Electricity Billing, Library operation, Pay roll, Insurance, Inventory, etc.

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 6201 COMPUTER GRAPHICS AND MULTIMEDIA L T P C
SYSTEMS 3 0 2 4

OBJECTIVES:
- To develop an understanding and awareness of how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
- To be familiar with various software programs used in the creation and Implementation of multi-media (interactive, motion/animation, presentation, etc.).
- To enable students to be practically sound in area of 2D, 3D and animation.
- To develop real time multimedia applications with user friendly environment.

MODULE I INTRODUCTION

MODULE II 2D TRANSFORMATIONS
Two dimensional transformations – Scaling and Rotations - Interactive Input methods - Polygons - Splines – Bezier Curves - Window view port mapping transformation.

MODULE III 3D TRANSFORMATIONS

MODULE IV OVERVIEW OF MULTIMEDIA
MODULE V  MULTIMEDIA SYSTEMS AND APPLICATIONS  09

Total Hours: 45

GRAPHICS AND MULTIMEDIA LAB:

1. Write a program for Line drawing using Bresenham Algorithm.
2. Write a program for Line drawing using DDA Line Drawing Algorithm.
3. Write a program for Circle Drawing using Bresenham Circle Drawing Algorithms.
4. Write a program for Line Clipping using Cohen-Sutherland Line clipping algorithm.
5. Write a program for 2D Transformations like Translations and Scaling and Rotations.
6. Write a program for 3D Transformations like Translations and Scaling and Rotations.
7. Write a program for 3D Projections like Parallel, Perspective
8. Create Frame by Frame Animations using multimedia authoring tools.
10. Create a JPEG image which demonstrates the various features of an image editing tool.

Use various software programs used in the creation and implementation of multi-media (interactive, motion/animation, presentation, etc.)

Total Hours: 30

TEXT BOOKS:

REFERENCES:


OUTCOMES:
On completion of this course, students will be able to

- Attain the complete knowledge in graphics & multimedia domain.
- Show their proficiency while working with Graphics and multimedia software’s and tools.
- Create interactive graphics applications in C++ using one or more graphics application programming interfaces.
- Design and develop a user-friendly multimedia application.
- Write programs that demonstrate 2D and 3D transformations
OBJECTIVES:

- Knowledge about the basic concepts of one dimensional and two-dimensional Random Variables.
- Knowledge on various probability axioms and theorems, probability distributions.
- To apply Estimation theory, Correlation, Regression and testing of hypothesis for real life problems.
- To enable the students to apply the concepts of multivariate normal distribution and principle components analysis and evaluate on the results

MODULE I    ONE DIMENSIONAL RANDOM VARIABLES 12
Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Functions of a Random Variable.

MODULE II   TWO DIMENSIONAL RANDOM VARIABLES 12
Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

MODULE III  ESTIMATION THEORY 12

MODULE IV   TESTING OF HYPOTHESES 12
Sampling distributions - Type I and Type II errors – Tests based on Normal, t, Chi-Square and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

MODULE V    MULTIVARIATE ANALYSIS 12
Random Vectors and Matrices - Mean vectors and Covariance matrices - Multivariate Normal density and its properties - Principal components Population principal components - Principal components from standardized variables.

Total Hours: 60
REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Apply fundamental concepts in Exploratory data analysis
- Demonstrate an understanding of the basic concepts of probability and random variables
- Analyze and choose among the probability distributions for application to a specific real life problem
- Apply inferential methods relating to the means of Normal Distributions.
- Demonstrate an appreciation of one—way analysis of variance (ANOVA)
- Interpret and analyze data that may be displayed in a two—way table
OBJECTIVES:
- To learn about different kinds of data structures that are suited to different kinds of applications
- To manage huge amounts of data efficiently,
- To understand the suitable applications of tree and graph data structure

MODULE I  LINEAR STRUCTURES  12
Abstract Data Types (ADT) – List ADT–array-based implementation–linked list implementation–cursor-based linked lists–doubly-linked lists–applications of lists–Stack ADT–Queue ADT– circular queue implementation– Applications of stack sand queues

MODULE II TREE STRUCTURES  12
Tree ADT - tree traversals–left child right sibling data structures for general trees – Binary Tree ADT - expression trees– applications of trees–binary search tree ADT– AVL trees–binary heaps

MODULE III HASHING AND SETS  12

MODULE IV GRAPHS AND THEIR APPLICATIONS  12

MODULE V ALGORITHM DESIGN AND ANALYSIS  12
Introduction to algorithm design techniques: Greedy algorithms, Divide and conquer, Dynamic programming, backtracking, branch and bound, Randomized algorithms– Introduction to algorithm analysis: asymptotic notations, recurrences–Introduction to NP-complete problems

Total Hours: 60

REFERENCES:

OUTCOMES:
At the completion of this course, the student will able to
- Compare and contrast various sorting and searching techniques
- Apply suitable shortest path algorithm in appropriate applications
- Manage the storage by using proper storage management technique
- Identify the strengths and weaknesses of different data structures
- Choose the appropriate data structure and algorithm design method for a specified application.
OBJECTIVES:

- Provide an overview of computer system and operating system
- Learn the scheduling mechanisms of operating systems
- Introduce the concepts of process management, memory management and storage management.
- Learn the concepts of deadlock detection and prevention algorithms.
- Understand the need for segmentation and page replacement in memory management techniques.

MODULE I    INTRODUCTION
Definition of OS-Mainframe System - Desktop Systems-Multi processor System-
Distributed-Clustered-Real time Systems-Handheld Systems-Operating System
Structure-System Components-Services-System Calls-System Programs-System Design and Implementation.

MODULE II    PROCESS MANAGEMENT
Concepts-Process Scheduling-Operations on Processes-Co-operating Processes-
Inter Process Communication - CPU Scheduling-Scheduling Concepts-Criteria-
Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling.

MODULE III    PROCESS SYNCHRONIZATION
Critical Section-Synchronization Hardware-Semaphores-Problems of
Synchronization-Critical Regions - Monitors - Deadlocks - Characterization-
Handling Deadlocks - Deadlock Prevention – Avoidance – Detection - Deadlock
Recovery.

MODULE IV MEMORY MANAGEMENT
Storage Hierarchy-Storage Management Strategies-Contiguous-Non Contiguous
Storage Allocation-Single User-Fixed Partition-Variable Partition - Swapping-Virtual
Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging-
MODULE V  I/O AND FILE SYSTEMS  10

Total Hours: 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Summarize the functions and objectives of operating systems
- Evaluate the design issues associated with operating systems.
- Compare and contrast scheduling mechanisms
- Analyze the memory management issues.
- Comprehend synchronization, deadlocks and multithreading.
- Illustrate the file system structure.
OBJECTIVES:

- Introduce various algorithmic techniques to solve the problems
- Study run-time efficiency of an algorithm
- Design and implement operations on stacks, queues, trees and graphs
- Design and implement algorithms for searching and sorting
- Determine the Big-O of an algorithm

ALGORITHM ANALYSIS:

1. Apply the divide and Conquer technique to arrange a set of numbers using merge sort method.
2. Perform Strassen’s matrix multiplication using divide and conquer method.
4. Construct a minimum spanning tree using greedy method.
6. Find the solution for traveling salesperson problem using dynamic programming approach.
7. Perform graph traversals.
8. Implement the 8 Queens Problem using backtracking.
10. Find the solution of traveling salesperson problem using branch and bound technique.

DATA STRUCTURES:

1. Represent the given sparse matrix using one dimensional array and linked list.
2. Create a Stack and do the following operations using arrays and linked lists
   (i) Push  (ii) Pop  (iii) Peep
3. Create a Queue and do the following operations using arrays and linked lists
   (i) Add  (ii) Remove
4. Implement the operations on singly linked list, doubly linked list and circular linked list.

5. Create a binary search tree and do the following traversals
   (i) In-order  (ii) Pre order  (iii) Post order

6. Implement the following operations on a binary search tree.
   (i) Insert a node (ii) Delete a node

7. Sort the given list of numbers using heap and quick sort.

8. Perform the following operations in a given graph
   (i) Depth first search  (ii) Breadth first search

9. Find the shortest path in a given graph using Dijkstra algorithm

**Total Hours: 60**

**OUTCOMES:**

On completion of this course, students will be able to

- Analyze the complexity of a given algorithm.
- Apply various data structure such as stacks, queues, trees, linked list and graphs to solve various computing problems
- Compare, contrast, and choose appropriate algorithmic design techniques to provide solution to the problem.
- Develop program that implements kruskal's algorithm, prims, binary search, all types of sorting, greedy algorithm and backtracking technique.
- Construct optimal binary search tree using dynamic programming technique.
- Find the solution for the n-queens problem and implement traveling salesman problem using dynamic programming.
OBJECTIVES

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

LIST OF EXPERIMENTS:

2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement Semaphores
5. Write a program to perform priority scheduling.
6. Write a program to implement CPU scheduling for Round Robin.
7. Write a program for page replacement policy using a) LRU b) FIFO c) Optimal.
8. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
9. Write a program to implement reader/writer problem using semaphore.
10. Write a program to implement Banker’s algorithm for deadlock avoidance.
11. Implement Bankers algorithm for Dead Lock Avoidance
12. Implement an Algorithm for Dead Lock Detection
13. Implement Threading & Synchronization Applications
14. Multiprogramming-Memory management- Implementation of Fork(), Wait(), Exec() and Exit() System calls
15. Simulate all File allocation strategies a) Sequenced b) Indexed c) Linked.

Total Hours: 60
OUTCOMES:
Students will able to:

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU.
3. Evaluate the requirement for process synchronization and coordination handled by operating system.
4. Describe and analyze the memory management and its allocation policies.
5. Identify use and evaluate the storage management policies with respect to different storage management technologies.
6. Identify the need to create the special purpose operating system.
OBJECTIVES:
- Enable the students to speak English with correct accent and pronunciation.
- Interact effectively in real life situations and in workplace.
- Develop the writing ability of students by providing them the required practice.
- Improve the written communication skill so as to write reports, letters etc.

MODULE I      LANGUAGE FUNDAMENTALS     03
Tenses, Subject – Verb Agreement, Correction of Errors.

MODULE II     ORAL COMMUNICATION       10
Oral practice – 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, conducting meetings, Participating in meetings-Phonetics- Correct Pronunciation.

MODULE III    WRITTEN COMMUNICATION    06
Writing a letter of application with resume - practical training - calling for quotations – placing an order – letter of complaint, Memoranda, Writing an email, Minutes - Report Writing - Project report - Writing a proposal.

MODULE IV     LANGUAGE LABORATORY      06
Language fundamental practices - Listening Comprehension, Reading Comprehension, Listening to correct pronunciation, Accent, Viewing models of Presentations, Interviews, Group Discussions in the language lab and practice in the class room.

Total Hours: 30

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions and face interviews.
- Write project and technical reports.
- Write formal letters and deliver oral presentations.
- Take part in social and professional communication.
SEMESTER III

CAD 7101 OBJECT ORIENTED SOFTWARE ENGINEERING  L  T  P  C
            3  0  2  4

OBJECTIVES:

- To introduce the basic concepts of software engineering and software life cycle models.
- To provide an insight into the concepts of modelling and notations of the different UML diagrams.
- To expose the techniques for requirement gathering design and specification.
- To emphasize the importance of testing.
- To state the basic strategy behind planning a project and tracking its progress.
- To learn about the software configuration management

MODULE I INTRODUCTION TO SOFTWARE ENGINEERING  09
Software engineering concepts- Software engineering development activities- Software life cycle models- Standards for developing life cycle models-Modelling with UML.

MODULE II REQUIREMENT ELICITATION  08
Introduction- Overview of requirements elicitation- Requirement elicitation concepts - Requirement elicitation activities - Managing requirement elicitation.

MODULE III ANALYSIS AND SYSTEM DESIGN  09
Overview of Analysis- Analysis concepts- Analysis activities- Managing analysis, System design concepts - System design activities - Managing system design.

MODULE IV OBJECT DESIGN AND SPECIFYING INTERFACE  09
Overview of object design- Reuse concepts- Reuse Activities- Managing reuse- Overview of interface specification- Interface specification concepts- Interface specification activities- Managing object design.

MODULE V IMPLEMENTATION, TESTING SOFTWARE CONFIGURATION MANAGEMENT  10
Managing and controlling Changes- Managing and controlling versions- Types of maintenance- Maintenance log and defect reports- Reverse and re-engineering.

**Total Hours: 45**

**OOSE (INTEGRATED LAB)**

The following analysis can be designed for different real time applications

1. Problem Analysis – Identify project scope, requirement and Objectives
2. Software Requirement Analysis – It defines the individual Phases of the project.
3. Data Modelling- use case diagrams and activity diagrams, build and test.
4. Class diagrams with the functions defined, sequence diagrams and add interface to class diagrams.
5. Software Development and Debugging.
6. Software Testing Prepare test plan and perform validation testing.
7. Remote computer monitoring (using virtualization tools)
8. Create and launch an app.
10. Platform assignment system for the trains in a railway station
11. E-mail Client system.

**Total Hours: 30**

**TEXT BOOKS:**


**REFERENCES:**


**OUTCOMES:**

Students who complete this course will be able to:

- Compare the different life cycle models and select appropriate one for a real time project.
- Illustrate the different UML diagram using various tools.
• Identify the different roles, responsibilities and artifacts produced during the different phases of software development process.
• Analyze the testing, risk and change management strategies.
• Demonstrate the ability to communicate effectively in writing.
• Analyze programming language concepts, particularly object-oriented concepts.
OBJECTIVES:

- To learn basic internet concepts, fighting against spam, conferencing on the internet, planning and creating website.
- To learn the fundamentals of Java and to introduce encapsulation, polymorphism, and the Java language mechanism (classes and objects) to implement it.
- To develop Java computer programs that perform various problem-solving algorithms.
- To develop the programming skills to use the object-oriented programming methodology to produce quality computer based solutions to real problems.
- To work with collection of API and develop fast programs.

MODULE I  BASIC INTERNET CONCEPTS  08
Connecting to the Internet – Domain Name System - Exchanging E-mail – Sending and Receiving Files - Fighting Spam, Sorting Mail and avoiding e-mail viruses – Chatting and Conferencing on the Internet – Online Chatting - Messaging – Usenet Newsgroup – Internet Relay chat (IRC) – Instant Messaging - Voice and Video Conferencing.

MODULE II  WORLD WIDE WEB  08

MODULE III  JAVA FUNDAMENTALS  08
MODULE IV   PACKAGES  

MODULE V   ADVANCED JAVA PROGRAMMING  

Total Hours: 45

TEXT BOOKS:


REFERENCES:


OUTCOMES:
On completion of this course, students will be able to

- List the various applications of internet and able to create , maintain and block the website.
- 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 and illustrate the life cycle of thread.
- Update and retrieve the data from the databases using sql
- Develop distributed applications using rmi
- Develop programs using the awt packages and collection framework
OBJECTIVES

- Constructing a mathematical representation of the problem under study.
- Deriving a solution using any of the appropriate mathematical models namely linear programming models, transportation and assignment models, integer programming models, scheduling by pert and cpm, queuing models.
- Analyze the alternatives and produce an optimal solution for the existing problem.

MODULE I  LINEAR PROGRAMMING MODELS  12
Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Variants of Simplex method.

MODULE II  TRANSPORTATION AND ASSIGNMENT MODELS  12

MODULE III  INTEGER PROGRAMMING MODELS  12
Formulation – Gomory’s IPP method – Gomory’s mixed integer method – Branch and bound technique.

MODULE IV  SCHEDULING BY PERT AND CPM  12

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.

L: 45, T : 15 Total Hours: 60

TEXT BOOK:

REFERENCES:


OUTCOMES:

On completion of this course, students will be able to

- Construct a real world problem into a mathematical problem.
- Identify the appropriate model to solve the problem.
- Explore the alternative models and justify on the selected model for representation.
- Analyze and provide a optimal solution.
- Construct the network and analyze the resources in network scheduling
OBJECTIVES:

- To understand the current trend and basics of cloud computing.
- To learn cloud services from different providers.
- To understand the collaboration of cloud services.
- To expose various ways to collaborate the cloud service online.
- To explore online tools available in cloud.

MODULE I UNDERSTANDING CLOUD COMPUTING 09

MODULE II DEVELOPING CLOUD SERVICES 09

MODULE III CLOUD COMPUTING FOR EVERYONE 09
Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.

MODULE IV USING CLOUD SERVICES 09
MODULE V OTHER WAYS TO COLLABORATE ONLINE


Total Hours: 45

REFERENCES:


OUTCOMES:

On completion of this course, students will be able to

• Understand 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 available tools
• Collaborate using online tools.
OBJECTIVES:

- To impart knowledge on mobile app paradigm, IOS components and services.
- To impart knowledge on controls and gestures, creating universal applications run on iPhone and iPad.
- To teach how to install and use appropriate tools for Android development, including IDE, device emulator, and profiling tools.
- Design and develop mobile app using android.
- To understand the basics of testing in Android.

MODULE I  INTRODUCTION TO IoS

Why IOS-The mobile App paradigm-Introduction to Xcode-main characteristics of mobile apps-Differences between mobile apps and desktop apps-How iOS is tailored to a mobile platform-IOS components and services-IPhone architecture-COCOA touch classes-interface builder.

MODULE II  APPLICATION DEVELOPMENT IN IPHONE

Controls and Gestures-Advance controllers Programming-Navigation based Application development-create Universal applications that run on both iPhone and iPad-Core Animation-Core Graphics APIs to do simple drawing-Handle touch events-Create and present editable tables of data—using UI Table View-accessing user photos and camera within an application.

MODULE III  INTRODUCTION TO ANDROID ARCHITECTURE

Introduction-History-Features-Android Architecture-setting up Android Application Environment-SDK-Application Environment and Tools, Android SDK-Programming paradigms and Application Components—Activity-Manifest File-Content providers, Broadcast receivers, Services-Interacting with UI-Persisting data using SQLite-packaging and deployment

MODULE IV  USER INTERFACE DESIGN


**MODULE V NATIVE CAPABILITIES AND TESTING**


**Total Hours: 45**

**TEXT BOOKS:**

**REFERENCES:**

**OUTCOMES:**
On completion of this course, students will be able to
- List the differences between mobile apps and desktop apps
- create Universal applications that run on both iPhone and iPad
- Handle touch events, work with Table View and access user photos and camera through an application.
- use the development tools in the Android development environment
- apply the Java programming language to build Android apps
- develop UI-rich apps using all the major UI components
- Implement the design using Android SDK
- Deploy mobile applications in Android and iPhone marketplace for distribution
CAD 7105  INTRODUCTION TO DATA SCIENCE  L  T  P  C  
3  0  0  3

OBJECTIVES:
- Students will develop relevant programming abilities.
- Students will demonstrate proficiency with statistical analysis of data.
- Students will develop the ability to build and assess data-based models.
- Students will execute statistical analyses with professional statistical software.
- Students will demonstrate skill in data management.

MODULE I  INTRODUCTION  9

MODULE II  EXPLORATORY DATA ANALYSIS  9
Exploratory Data Analysis - Getting and Cleaning data Statistical Inferences - Summarizing and Visualizing the Data.

MODULE III  MATHEMATICAL TOOLS  9

MODULE IV  MACHINE LEARNING  9
Machine Learning in Data Science Supervised, unsupervised, reinforcement and deep learning, Naives Bayesian Algorithm, K means, K nearest Neighbourhood 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 BOOS:

- Additional references and books related to the course:

OUTCOMES:

The outcome of this course is that the student will possess the following data science skills and abilities:

- Identify and assess the needs of an organization for a data science task.
- Collect and manage data to devise solutions to data science tasks
- Interpret data science analysis outcomes.
- Effectively communicate data science-related information effectively in various formats to appropriate audiences.
- Transform findings from data resources into actionable business strategies
OBJECTIVES:
- Understand the mobile programming aspects, design and implementation on android platforms.
- Develop and deploy mobile applications for the Android operating system using basic and advanced phone features.
- Understand some basic concepts of R programming
- Expose on some fundamental concepts of cloud computing
- To understand the fundamentals of basic programming languages.

1. MOBILE APPLICATION DEVELOPMENT LAB
   - List of Exercises using Android / IOS

2. R PROGRAMMING LAB
   - Basic R programs using Array, Data frame, Matrix, Vector, List and Factors.

3. CLOUD COMPUTING LAB
   - Create NFS & VMFS Data store in the vSphere Web Client
   - Load Balancing in AWS
   - Manage Hosts on a vSphere Distributed Switch in the vSphere Web Client

OUTCOMES:
On completion of this course, students will be able to
- 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.
- Implement R programming in data science.
- Deploy cloud computing technologies in real time projects.
- Understand the fundamentals of programming languages.
- Explore knowledge in different programming languages.
CADE 7107  PROGAMMING IN JAVA   L   T   P   C   0   0   4   2

OBJECTIVES:
- to develop the programming skills using the object oriented programming methodology to produce quality computer based solutions to real problems.
- to utilize the advance features of Java technology.
- demonstrate the use of Application Programming Interface (API) and develop programs
- to develop good multithreaded programs

JAVA PROGRAMMING:
1. Program to illustrate the use of overloading and overriding.
2. Program to implement the concept of inheritance.
3. Program to illustrate the use of multi-threading.
4. Program to implement the concept of Interfaces and packages.
5. Generate the program using exceptions handling mechanism.
6. Implement the file operations.
7. Program using Applets.
8. Program to handle Mouse Events, Keyboard Events and work with GUI components.
9. Program using JDBC.

Total Hours: 60

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
- write programs using graphical user interface (GUI) components and various event handling methods.
- implement file operations and connect with database using JDBC.
OBJECTIVES:

- To make use of the Internet related technologies.
- To analyse advantages and use of different types of CSS.
- To design static and interactive web pages by embedding Java Script code in HTML and Use Java Script to validate user input.
- To teach the importance of functional programming to improve web applications.
- To Know how to embed media—such as audio or video—into a web page.
- To apply the basics of PHP and connect with MySQL database.

MODULE I  INTRODUCTION TO WWW  09

MODULE II  BUILDING WEB BASED APPLICATION USING HTML  09

MODULE III  CASCADING STYLE SHEET  09
Introduction to Style sheet, Types of Style sheet, concept of class & ID, Different CSS Property-Background Property- Font property- Text -Dimensions-Combinators-Borders-Margins-Padding-Box Model.

MODULE IV CLIENT SIDE SCRIPTING LANGUAGE  09
Concept and types of Scripting language, Introduction to Javascript, How to develop Javascript, Operators, Conditional Structure & Looping Structure, Dialog Boxes, Arrays, User Define Function, Javascript Function keyword, Function Expression, Constructor, Self Invoking Functions, Built-in Functions (String, Math, Date, Array),
Built-in Object (window, screen, location, history, Navigator), DOM, Forms, Objects and its events - Functional Programming.

**MODULE V  PHP COMPONENTS**

Introduction to PHP, Basic PHP syntax: PHP tags, PHP statements and whitespace, comments, Operators, Conditional and Looping Structure, User Define Functions, Arrays. GET and POST Methods. GD Library, Cookies, Session, Server Variables, Database Connectivity with MySQL, PHP My Admin, Regular Expression, PHP with OOP (Class, constructor, inheritance), PHP with AJAX – Introduction-Sending Email using PHP.

**Total Hours: 45**

**TEXT BOOK:**
1. Developing Web Application, Wiley India Publication, Ralph Moseley, Wiley India, 2007.

**REFERENCE BOOKS:**

**OUTCOMES:**
On completion of this course, students will be able to

- differentiate web and website and summarize the importance of web languages in the development of website.
- apply JavaScript, HTML and CSS3 effectively to create interactive and dynamic websites
- build web applications using PHP and submit the form using GET or POST method.
- create layout in websites using Div tags and incorporate pre-designed elements into them.
- develop server side code using PHP and able to connect and manipulate the MySQL database.
OBJECTIVES:

- To describe the role of XML in enterprises.
- To teach the importance of various supporting technologies in XML.
- To describe the role of SOAP in building web services, the basics of the SOAP protocol, and the structure of a SOAP document.
- To impart knowledge on UDDI registries and WSDL in creating web-services clients.
- To cover the basics of XML, Schemas, WSDL, and Web Services concepts.

MODULE I  INTRODUCTION


MODULE II  XML TECHNOLOGY


MODULE III  SOAP


MODULE IV  WEB SERVICES

Overview – Architecture – Key Technologies - UDDI – WSDL – ebXML – SOAP and Web Services In E-Com – Overview of .NET and J2EE.

MODULE V  XML SECURITY


Total Hours: 45

TEXT BOOK:

REFERENCES:


OUTCOMES:

On completion of this course, students will be able to

- list the importance of XML
- differentiate the various technologies of XML and their working.
- assess the role played by SOAP and web services
- recognize the need for XML security.
- build effective XML documents.
- build DTD documents to validate XML.
- build Schema documents to validate XML.
OBJECTIVES:
- To introduce both the traditional approach to machine learning using symbolic representations and manipulations,
- To understand the knowledge representations and problem-solving techniques.
- To impart knowledge on machine learning techniques and its associated computing techniques and technologies.
- To learn different model parameters for different machine learning techniques.
- To describe the application of these machine learning techniques in data mining.

MODULE I

12

MODULE II

12

MODULE III

12

MODULE IV

12
Clustering Methods-Partitioned based Clustering - K-means- K-medoids; Hierarchical Clustering - Agglomerative- Divisive- Distance measures; Density based Clustering - DBScan; Spectral clustering.
MODULE V


Total Hrs. : 60

TEXT BOOK AND REFERENCES:
5. ShaiShalev-Shwartz, Shai Ben-David, “Understanding Machine Learning: From

OUTCOMES:
On completion of this course, students will be able to

- Identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
- Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
- Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
- Integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and map reduce.
CAD 7204 WEB DESIGN AND DEVELOPMENT LABORATORY

OBJECTIVES:

- To provide the student with the fundamental knowledge and skills to become a proficient web programmer
- Impart the knowledge of developing static and dynamic web page using HTML, CSS and JavaScript.
- To learn how to perform validation using JavaScript
- To impart designing online application and access database using MYSQL

LIST OF LAB EXERCISES

1. Design the static web page using frames, links and tables for any application.
2. Creation of HTML pages using ordered list, unordered list, definition list and hotspots
3. Create webpage to embed audio and video.
4. Usage of internal and external CSS along with HTML pages
5. Develop web pages using Background property, Font property, Dimensions, Box model, Combinators and Borders in CSS
6. Client side Programming
   i. JavaScript for displaying date and comparing two dates
   ii. Form Validation including text field, radio buttons, check boxes, list box and other controls
   iii. Design a digital clock
   iv. Develop Simple calculator
7. Developing online applications such as shopping, railway/air/bus, education using HTML, CSS, Javascript and PHP
8. Develop programs using control structures and arrays in PHP
9. Any online application using PHP and submit the form using GET or POST method.
10. Database connectivity in PHP
OUTCOMES:

On completion of this course, students will be able to

- build XML data file and validate using DTD and XML schema
- design and development applications using XML, DOM and DSO
- design and implementation of Web forms and Web services.
- to design static and dynamic web pages
- to solve problem related to web based applications
OBJECTIVES:

- to provide the knowledge necessary to build and validate XML.
- to equip the students with XML, a core technology in Web Services.
- to understand the background of the underlying technologies.
- to cover the basics of XML, Schemas, WSDL, and Web Services concepts

LAB EXERCISES:

1. Create an XML document to store an address book.
2. Create an XML document to store information about books and create the DTD files.
4. Create an XML document to store resumes for a job web site and create the DTD file.
7. Use Microsoft DOM to navigate and extract information from the book’s XML document.
8. Use Microsoft DSO to connect HTML form or VB form to the book’s XML document and display the information.
9. Create a web service for temperature conversion with appropriate client program.
10. Create a web service for currency conversion (at five currencies) with appropriate client program.

OUTCOMES:

On completion of this course, students will be able to
- build effective XML documents.
- build DTD documents to validate XML.
- build Schema documents to validate XML.
- describe services using WSDL.
- build and consume Web services.
- specify the role of web services in commercial applications.
- understand the principles of web service provision.
- understand the use of Java for implementing web services.

Total Hours: 60
OBJECTIVES:

- Attitude Control and Quick Personal Self Esteem Improvement
- Interview Motivation and Developing Personal Confidence using NLP
- Effective Answering and Maintaining Fluent Communication
- Positive Body Language
- Effective Resume Creation
- Leadership Skills, Team Player Skills and Career Plan to HR

MODULE I MOTIVATION 05

MODULE II LEADERSHIP SKILLS 04
Types of Leadership - Leadership Process and Thinking - Innovative Thinking - Role of Competency, Discipline, Planning and Ethics – Creating Cooperation and Trust in Team Building Process – Mentoring.

MODULE III EFFECTIVE COMMUNICATION I 04
Eliminating Stage Fright - Increasing Fluency - Increasing Focus while Listening - How to communicate as a Follower - How to communicate as a Leader - Assertive and Polite Communication.

MODULE IV EFFECTIVE COMMUNICATION II 05

Total Hours: 30

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- understand the significance of soft skills in the working environment
- communicate effectively and present their concepts in a more confident manner.
- engage in debates and participate in group discussions.
- recognize the different leadership styles
- take part in social and professional communication.
- develop self-motivation, raised aspirations and belief in one’s own abilities, defining and committing to achieving one’s goals.
SEMESTER V

CAD 8101          PYTHON PROGRAMMING

OBJECTIVES
By the end of the course, students will be able to:

- To understand the structure and syntax of Python language.
- To establish proficiency in fundamentals of writing Python scripts.
- To learn the concepts of file I/O and handling of errors and exceptions.
- To discover the features of python structures and flow control.
- To use and manipulate several core data structures: Lists, Dictionaries, Tuples, and Strings.

MODULE I          INTRODUCTION TO PYTHON

MODULE II         BUILT IN FUNCTIONS

MODULE III        DATE AND TIME FUNCTIONS
Date & Time – Getting current Time-Formatted Time-Time Tuple-Time Module- Calendar Module- Functions –Defining Functions-Calling Functions-Types of Function Arguments- Anonymous Functions-Modules - import Statement- Namespaces and Scoping.

MODULE IV         FILES AND EXCEPTIONS
Files I/O -Printing to the Screen- Reading Keyboard Input- Opening and Closing Files- Reading and Writing Files- Renaming and Deleting Files- Directories in Python- Exceptions-Except Clause.
MODULE V ADVANCED PHYTHON 10

Advanced Python - Classes/Objects - Creating Classes and Instance Objects - Built-In Class Attributes - Class Inheritance - Overloading Methods - Reg Expressions - Regular Expression Modifiers and Patterns - Database Access - Sending Email.

Total Hrs. :45

TEXTBOOKS

2. Python In A Day: Learn The Basics, Learn It Quick, Start Coding Fast (In A DayBooks) (Volume 1) by Richard Wagstaff
3. Python Programming: An Introduction to Computer Science– December, 2003 by John Zelle

OUTCOMES:

On Completion of the course the students will be able to
- List the string and math built in functions.
- Handle the file-system with python scripts
- Classify and Design functions, modules and classes.
- Demonstrate the use of the built-in data structures 'list' and 'dictionary'.
- Perform file operations like open, create, read, write and close the file.
- Create class, inherit the class, overload the methods and handle regular expressions.
OBJECTIVES:
By the end of the course, students will be able to:

- To understand the fundamentals of Internet of Things (IoT) and its protocols.
- To learn the architecture and design methodology of IoT.
- To expose on the various components of Raspberry Pi.
- To build a small low cost embedded system using Arduino / Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

MODULE I  FUNDAMENTALS OF IOT  08

MODULE II  ENGINEERING IOT NETWORKS  08
Smart Objects: The “Things” in IoT - Connecting Smart Objects - IP as the IoT Network Layer - Application Protocols for IoT.

MODULE III  DEVELOPING INTERNET OF THINGS  09
IoT Platforms Design Methodology – Case study on IoT system - Python packages of Interest for IoT.

MODULE IV  PHYSICAL DEVICES & ENDPOINTS  12

MODULE V  CASE STUDIES and ADVANCED TOPICS  08
Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IoT.

Total Hours: 45
INTERNET OF THINGS (INTEGRATED LAB)

- Study and Install IDE of Arduino and different types of Arduino.
- Write Program for RGB LED using Arduino.
- Study the Temperature sensor and find monitor sensor using Arduino.
- Study and Implement RFID, NFC using Arduino.
- Study and implement MQTT protocol using Arduino.
- Study and Configure Raspberry Pi.
- Write a program for LED blink using Arduino and Raspberry Pi.
- Study and Implement Zigbee Protocol using Arduino / Raspberry Pi

Total Hours: 30

TEXT BOOK AND REFERENCES:

OUTCOMES:
Upon the completion of the course the student should be able to
- Summarize the characteristics of IoT and differentiate physical and logical design.
- Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
- Develop web services to access/control IoT devices
- Deploy an IoT application and connect to the cloud
- Analyze applications of IoT in real time scenario
OBJECTIVES:
By the end of the course, students will be able to:
• Bring together several key technologies used in manipulating, storing, and analysing big data.
• Make the student understand details of Hadoop.
• Introduce tools that provide SQL-like access to unstructured data.

MODULE I  INTRODUCTION TO BIG DATA
Big Data and its Importance – Four V’s of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

MODULE II  BIG DATA TECHNOLOGIES
Hadoop’s Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data – Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.

MODULE III  PROCESSING BIG DATA
Integrating disparate data stores - Mapping data to the programming framework
- Connecting and extracting data from storage - Transforming data for processing
- Subdividing data in preparation for Hadoop Map Reduce.

MODULE IV  HADOOP MAP REDUCE
Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms – Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

MODULE V  ADVANCED ANALYTICS PLATFORM
Real-Time Architecture – Orchestration and Synthesis Using Analytics Engines

**Total Hours: 45**

**TEXT BOOK AND REFERENCES:**


**OUTCOMES:**

On Completion of the course the students will be able to

- categorize and Summarize Big Data and its importance.
- manage Big Data and analyze Big Data.
- apply tools and techniques to analyze Big Data.
- Analyze the big data analytic techniques for useful business applications.
- Work with big data platform
OBJECTIVES:
- To understand the fit between individual and their entrepreneurial ambitions.
- To identify the customers and find a problem worth solving.
- To create a business model for solving the problems of customer, forming solution and present the Business Model Canvas
- To develop a solution for customers' problem and analyze the problem solution fit & product market fit.
- To build and demonstrate a Minimum Viable Product (MVP) for startup.
- To analyze and understand the impact of social entrepreneurship on society and cases.

MODULE I  SELF & OPPORTUNITY DISCOVERY  9
Finding the flow, Effectuation, Entrepreneurial Style, Business Opportunities, Problem Identification, Design Thinking, Potential solutions, Presentation of the problem- Case Study.

MODULE II  CUSTOMER , SOLUTION AND BUSINESS MODEL  9

MODULE III  VALIDATION AND MONEY  9

MODULE IV  TEAM BUILDING, MARKETING, SALES AND SUPPORT  9
Shared Leadership, Hiring, Fitment , Team Role and Responsibilities , collaboration Tools and Techniques, Positioning and Branding, Channels - Sales Planning, Selling Skills, Project Management, Project Tracking, Basic of Business Regulation, Startup.
MODULE V IMPACT OF SOCIAL ENTREPRENEURSHIP ON 9 SOCIETIES AND CASES

Impact of Social Entrepreneurship, NGO vs For-Profit Companies vs. Social Entrepreneurship. Procedures for registration of small scale industry, Overview of venture capital and angel investment, Social entrepreneurship report preparation by students. Case Study of Social Entrepreneurs

Total Periods- 45

TEXT BOOKS
2. Learn wise platform - Wadhwani Foundation, 2018

REFERENCES

OUTCOMES:
On completion of the course, students will be able to
- Build an entrepreneurial mindset and reach out the customer to identify the problem using design thinking process
- Craft solution to the problem through value proposition canvas and develop a business model using lean canvas
- Provide product solution demo and deliver a minimum viable product
- Work as a team and create brand strategy marketing for product/service
- Prepare, make an outstanding sale pitch for startup.
- Showcase the impact of Social Entrepreneurship on society and cases.
OBJECTIVES:
Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python
- Build Web Services and introduction to Network and Database Programming in Python

LIST OF PROGRAM TOPICS
1. Basic Programs
2. Array Programs
3. List Programs
4. String Programs
5. Dictionary Programs
6. Tuple Programs
7. Searching and Sorting Programs
8. Pattern Printing
9. Date-Time Programs
10. More Python Programs

Total Hours: 60

OUTCOMES:
- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists,
- Dictionaries and use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
MINI PROJECT

OBJECTIVES:
The main objectives of the Mini-Project is,

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

GUIDELINES
The students undertake individual application project based on their interest level. The projects must be approved by the project coordinators.

REPORT AND DOCUMENTATION
- Students must maintain a lab record and update the project progress on a weekly basis.
- Must demonstrate during lab hours and update the project progress on a weekly basis.
- Must submit a detailed project report as per the common template for a ProjectViva-voce examination.
- Monthly review will be conducted and evaluated by the coordinators.

PROJECT EVALUATION CRITERIA
The Project coordinators verify and validate the information presented in the project report. The split-up of marks is as follows:

1. Internal Assessment
2. External Examination
3. Viva Voce
INTERNAL ASSESSMENT
Internal Evaluator must evaluate Internal Project work based on the following criteria:

- Project Scope, Objectives and Deliverables
- Software Requirement analysis, design, coding and testing skills
- Report writing and presentation skill

EXTERNAL EXAMINATION
The examiners make individual assessment based on the following criteria.

- Software Requirement Specifications
- Project Demonstration
- Project Report
- Viva Voce

VIVA VOICE
Confidence level, Programming knowledge, Professional approach and Communication Skill

TOTAL MARKS
1. Internal Evaluation: 75 %
2. External Evaluation: 25 %

INTERNAL EVALUATION FOR 75 MARKS
- Review1: 15 marks
- Review2: 15 marks
- Project Novelty: 5 marks
- SRS : 10 marks
- Design : 10 marks
- Coding : 10 Marks
- Testing : 5 marks

EXTERNAL EVALUATION FOR 25 MARKS
- Demonstration 5 marks
- Project Report: 10 marks
- Viva-Voce 10 marks
The Project evaluator(s) verifies and validates the information presented in the project report.

**OUTCOMES:**
On completion of the Mini-Project, students will be able to

- Understand, plan and execute a Mini Project with team.
- Design and Model a prototype for real time system.
- Implement software/ electronic hardware by learning required testing and troubleshooting tools.
- Prepare a technical report based on the Mini project.
- Deliver technical seminar based on the Mini Project work carried out.
OBJECTIVES:

- To apply the knowledge and skill components in the real time/ research projects.
- To understand the various software requirements and design challenges with appropriate tools.
- To apply the various skill metrics to write effective code using appropriate languages or platforms.
- To understand the practical difficulties in implementing the project with the available software and hardware resources.
- To improve the communicative efficacy by writing effective reports and providing training for the end users.

OUTCOMES:
On completion of the course, students will be able to

- Define and describe real time/ research project scopes, objectives and deliverables.
- Design fundamental unified modelling language diagrams covering all modules of the project.
- Write effective programs to develop user interface design, processing logic and generate reports.
- Apply various software testing tools for all the modules of the project and Implement with end user training.
- Demonstrate the working project to the end user with consolidated project report.
TECHNOLOGY ELECTIVES

CADY 101 MOBILE COMMERCE  L  T  P  C  
3  0  0  3

OBJECTIVES:
- To understand the E-Commerce strategies and value chains.
- To understand the M-Commerce extended services.
- To understand and evaluate the requirements of M-Commerce infrastructure.
- To update the knowledge level on latest mobile computing and application domains.
- To apply mobile commerce transactions in B2B business cases.

MODULE I INTRODUCTION TO ELECTRONIC COMMERCE  09
Introduction to e-commerce – e-commerce environment and market place - Internet and wireless communication - impact of the electronic communications on traditional businesses - Definition of E-commerce and E-Business – Differences between E-commerce and E-Business-Types of E-commerce –Intranets and Extranets- Web 2.0 & Web 3.0 –Evolution of Web technologies

MODULE II MOBILE COMMERCE  09
Definition of Mobile commerce - Wireless Internet access standards-Wireless Internet access standards – Wireless Application protocols- Wireless Internet access consumer proposition-SMS applications and QR code-Wi-Fi Standard protocol - Hot spot and Bluetooth Wireless application-Strategies for Mobile Commerce.

MODULE III GENERAL ARCHITECTURE FOR M-COMMERCE SERVICES  09

MODULE IV M-COMMERCE IN BUSINESS MODELS  09
MODULE V CONVERGENCE OF TECHNOLOGIES IN B2B - CASE STUDY 09

REFERENCE BOOKS

OUTCOMES:
The students will be able to:
- To define the scope of e-business problem and e-commerce elements with value chain integration.
- To design the web portal for a distributed system based on the E-Commerce principles.
- To design operational support system for location based mobile commerce.
- To implement the M-commerce transactions in payment module using wireless application protocol for any one of the business verticals.
- To design and build a comprehensive B2B web portal with m-commerce transactions.

Total Hours 45
# MOBILE SECURITY

## OBJECTIVES:
- To learn the need for security and privacy in Mobile and Wireless Networks.
- To impart knowledge on mobile cellular systems and its architecture.
- To understand the operational process involved in secured wireless networks like LAN, Bluetooth and Zigbee.
- To provide basic knowledge on different key management techniques.
- To emphasize on various security challenges in RFID technology.

### MODULE I  INTRODUCTION

### MODULE II  MOBILE SECURITY
Mobile system architectures, Overview of mobile cellular systems, GSM and UMTS Security & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security.

### MODULE III  SECURING WIRELESS NETWORKS
Overview of Wireless security, Scanning and Enumerating 802.11 Networks, Attacking 802.11 Networks, Attacking WPA protected 802.11 Networks, Bluetooth Scanning and Reconnaissance, Bluetooth Eavesdropping, Attacking and Exploiting Bluetooth, Zigbee Security, Zigbee Attacks

### MODULE IV  ADHOC NETWORK SECURITY

### MODULE V  RFID SECURITY
Introduction, RFID Security and privacy, RFID chips Techniques and Protocols, RFID anti-counterfeiting, Man-in-the-middle attacks on RFID systems, Digital Signature Transponder, Combining Physics and Cryptography to Enhance Privacy in

**Total Hours: 45**

**REFERENCES**


**OUTCOMES:**

**On completion of this course, students will be able to:**

- Identify the issues and challenges faced by Mobile and Wireless Networks.
- Describe the functions and architecture of mobile cellular systems.
- Compare and analyse the functions of secured wireless networks.
- Analyse the solutions for security threats in wireless mobile networks using public key management techniques.
- Depict the process of RFID technology and its security enhancement.
OBJECTIVES:
- To understand the different types of networks and its security challenges.
- To learn the architecture and framework of secured mobile systems.
- To acquire knowledge about the working of android devices.
- To study on the issues and challenges of Digital forensics.
- To impart knowledge on different techniques to overcome the issues in digital forensics.

MODULE I INTRODUCTION TO WIRELESS TECHNOLOGIES

MODULE II SECURITY FRAMEWORK FOR MOBILE SYSTEMS
CIA triad in mobile phones-Voice, SMS and Identification data interception in GSM: Introduction, practical setup and tools, implementation- Software and Hardware Mobile phone tricks: Net monitor, GSM network service codes, mobile phone codes, catalog tricks and AT command set- SMS security issues.

MODULE III MOBILE PHONE FORENSICS
Crime and mobile phones, evidences, forensic procedures, files present in SIM card, device data, external memory dump, evidences in memory card, operator’s systems-Android forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques.

MODULE IV INTRODUCTION TO DIGITAL FORENSICS
MODULE V ANALYSIS OF DIGITAL FORENSIC TECHNIQUES  08
Digital forensics examination principles: Previewing, imaging, continuity, hashing and evidence locations- Seven element security model- developmental model of digital systems- audit and logs- Evidence interpretation: Data content and context.

Total Hours:  45

REFERENCES

OUTCOMES:
On completion of this course, students will be able to:

- Describe the different types of networks and its functions.
- Illustrate the architecture and framework of secured mobile systems.
- Compare the working model of android devices.
- Depict the various methodologies for device handling and identification in digital devices.
- Analyse and compare the digital forensics techniques in real time environment.
**CADY 201 PRINCIPLES OF VIRTUALIZATION**  
**L T P C**  
3 0 0 3

**OBJECTIVES:**
- To provide the knowledge necessary to build the virtualization architecture.
- To equip the students with basic knowledge of orchestrating containers.
- To understand the different types of virtualization.
- To cover the basics of data centres and virtualizations.
- To understand the concepts of virtual storage.

**MODULE I OVERVIEW OF VIRTUALIZATION** 09

**MODULE II SERVER CONSOLIDATION** 09

**MODULE III NETWORK VIRTUALIZATION** 09
Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design – WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization– VLANs and Scalability.

**MODULE IV VIRTUALIZING STORAGE** 09

**MODULE V VIRTUAL MACHINES PRODUCTS** 09

**Total Hours: 45**
TEXT BOOK AND REFERENCES:

OUTCOMES:
On completion of this course, students will be able to:

- Understanding the principles of virtualization.
- To learn the architectures and models of virtualization.
- To learn the Service Oriented Architecture (SOA).
- To learn and practice the Cloud programming models and frameworks.
- To learn how the systems working using VMware.
OBJECTIVES:
- To provide the terminology used in cloud computing.
- To provide the core concepts used in cloud computing.
- To understand the business trends in cloud computing.
- To build a Private Cloud.
- To equip the student with the core responsibilities of a cloud architect.

MODULE I  CLOUD COMPUTING FUNDAMENTALS  08
Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

MODULE II  CLOUD APPLICATIONS  06
Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.

MODULE III  MANAGEMENT OF CLOUD SERVICES  12
Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud-based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat).

MODULE IV  APPLICATION DEVELOPMENT  10
Service creation environments to develop cloud-based applications. Development environments for service development; Amazon, Azure, Google App.

MODULE V  CLOUD IT MODEL  09
Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service,
applications and development platform deployment so as to improve the total cost of ownership (TCO).

Total Hours: 45

TEXT BOOK AND REFERENCES

OUTCOMES:
On completion of this course, students will be able to:
- To understand common reasons why SaaS solutions are selected over traditional software purchases.
- To understand common reasons why PaaS Solutions are selected over traditional application deployment solutions.
- To learn how global infrastructure facilitates cloud computing.
- Create combinatorial auctions for cloud resources and design algorithms for computing clouds.
- Cloud Backup and solutions.
OBJECTIVES

- To identify storage and content delivery components
- To Compare object storage and block storage
- List compute components commonly used for cloud computing
- To provide the infrastructure of the AWS.
- To examine different cloud computing services

MODULE I VIRTUALIZED DATA CENTER ARCHITECTURE 09
Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, IaaS. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures.

MODULE II INFORMATION STORAGE SECURITY & DESIGN 09
Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments. Monitoring and management; security auditing and SIEM.

MODULE III STORAGE NETWORK DESIGN 12
Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.

MODULE IV OPTIMIZATION OF CLOUD STORAGE 06
Global storage management locations, scalability, operational efficiency. Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attitudes; file systems or object storage.

MODULE V INFORMATION AVAILABILITY DESIGN 09
Designing backup/recovery solutions to guarantee data availability in a virtualized environment. Design a replication solution, local remote and advanced. Investigate Replication in NAS and SAN environments. Data archiving solutions; analyzing compliance and archiving design considerations.
TEXT BOOKS AND REFERENCES


OUTCOMES:

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

- To learn the storage and content delivery components.
- Describe the security of data-at-rest.
- To Design & develop backup strategies for cloud data based on features.
- Define Cloud Computing and memorize the different Cloud service and deployment models
- Describe importance of virtualization along with their technologies.
### OBJECTIVES
- To identify the different components of cloud security.
- To describe perimeter security.
- To describe key management.
- To describe data security and firewalls.
- To provide distributed denial of services detection and mitigation strategies.

### MODULE I SECURITY CONCEPTS
Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.

### MODULE II MULTI-TENANCY ISSUES
Isolation of users/ VMs from each other. How the cloud provider can provide this; Virtualization System Security Issues- e.g. ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; Virtualization System Vulnerabilities- Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware (botnets etc).

### MODULE III VIRTUALIZATION SYSTEM-SPECIFIC ATTACKS
Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking.

### MODULE IV TECHNOLOGIES FOR VIRTUALIZATION-BASED SECURITY ENHANCEMENT
IBM security virtual server protection, virtualization-based sandboxing; Storage Security- HIDPS, log management, Data Loss Prevention. Location of the Perimeter.
MODULE V   LEGAL AND COMPLIANCE ISSUES
Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Total Hours: 45

TEXT BOOKS AND REFERENCES

OUTCOMES:
On completion of this course, students will be able to:
- To understand the chain of custody guarantee.
- To understand the ad hoc audits and exception notifications.
- To understand the policy-based compliance reporting.
- Able to understand and explain various security solutions for Web and Cloud infrastructure.
- Able to describe the functioning of platform as a service.
CRYPTOGRAPHY FUNDAMENTALS

OBJECTIVES:

- To deliver a better understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
- To study the various classical and symmetric encryption techniques.
- To introduce different asymmetric encryption techniques and remote user authentication principle.
- To enrich the knowledge on Digital Signature Standard and provide solutions for their issues.
- To learn cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel.

MODULE I  INTRODUCTION TO COMPUTER AND NETWORK SECURITY  09

MODULE II  SYMMETRIC CIPHERS  09

MODULE III  ASYMMETRIC CIPHERS  09
MODULE IV CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS


MODULE V MUTUAL TRUST


TEXT BOOKS AND REFERENCES:


OUTCOMES:

Students who complete this course will be able to:

- Compare different encryption techniques; design Principles and modes of operation.
- Design a security solution for a given application
- Devise the Key Management techniques and Number Theory.
- Understand Message Authentication Codes and Hash Function keys
- Compare and design different public key cryptographic techniques.
OBJECTIVES:

- The course covers both the principles and practice of digital forensics. Societal and legal impact of computer activity: computer crime, intellectual property, privacy issues, legal codes; risks, vulnerabilities, and countermeasures; methods and standards for extraction, preservation, and deposition of legal evidence in a court of law.
- This course provides hands-on experience in different computer forensics situations that are applicable to the real world.
- Students will learn different aspects of digital evidence: ways to uncover illegal or illicit activities left on disk and recovering files from intentionally damaged media with computer forensics tools and techniques.
- To become familiar with forensics tools
- To learn to analyze and validate forensics data

MODULE I  INTRODUCTION TO COMPUTER FORENSICS  09
Computer crimes, evidence, extraction, preservation, etc. Overview of hardware and operating systems: structure of storage media/devices, windows/Linux registry, boot process, file systems, file metadata. Data recovery: identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files.

MODULE II  COMPUTER FORENSIC TOOLS AND DIGITAL EVIDENCE CONTROLS  09
Encase, Helix, FTK, Autopsy, FIRE, Found stone Forensic Toolkit, WinHex and other open source tools. Uncovering the attacks detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary & Cache files.

MODULE III  MOBILE NETWORK FORENSICS  09
MODULE IV  SOFTWARE REVERSE ENGINEERING  09
Defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.

MODULE V  COMPUTER CRIME AND LEGAL ISSUES  09
Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court of law.

Total Hours: 45

TEXTBOOKS:

REFERENCE BOOKS:
- Computer Forensics: Hard Disk and Operating Systems, EC Council, September 17, 2009
- Computer Forensics Investigation Procedures and response, EC-Council Press, 2010
- EnCase Computer Forensics., 2014
- NIST Computer Forensic Tool Testing Program (www.cftt.nist.gov/)
- Computer Forensics: Investigating Data and Image Files (Ec-Council Press Series: Computer Forensics) by EC-Council (Paperback - Sep 16, 2009)

Other Resources:
Computer Forensic Training Center Online http://www.cftco.com/
8. CERIAS Forensics Research (http://www.cerias.purdue.edu/research/forensics)

OUTCOMES:
Students who complete this course will be able to:
• Understand the need for computer forensics tools in the real time environment.
• Gain hands on experience in different computer forensics situation.
• Enrich their knowledge on different forensics tools.
• Apply the concepts of software reverse engineering techniques in the real time environment.
• Protect against different computer crime and legal issues.
atte Analytics and Visualisation

OBJECTIVES:
- Develop skills to both design and critique visualisations
- Understand why visualization is an important part of data analysis
- Understand the components involved in visualization design
- Understand the type of data impacts the type of visualization.
- To know about the research that requires the integration of large amounts of data.

MODULE I  INTRODUCTION

MODULE II  DATA VISUALISATION-I
Text Data Visualization - Interactivity and Animation - Temporal Data Visualization.

MODULE III  DATA VISUALISATION-II
Geospatial Data Visualization - Visualization Case Studies.

MODULE IV  DATA VISUALISATION-III
Redesign Principles and Design Dimensionality - Hierarchical Data Visualization - Network Data Visualization.

MODULE V  DATA VISUALISATION TOOLS
Introduction to R, Python, and D3 for data visualization, Statistical visualizations (histograms, scatterplots) and times series data. Introduction to web-based visual displays for broad and deep visualizations. Introduction to the D3 javascript framework. Introduction to Many Eyes and Bubble charts.

Total Hours: 45

TEXT BOOKS AND REFERENCES
2. Scott Murray "Interactive Data Visualization for the Web" O'Reilly Media, 2012.

**OUTCOMES:**

**On completion of this course, students will be able to:**

- Prepare data for visualization
- Design visualizations
- Use web technology to create visualizations.
- Work with big data tools and its analysis techniques to visualize the data
- Perform analytics on data streams
CADY 402     SOCIAL MEDIA ANALYTICS     L T P C
                          3 0 0 3

OBJECTIVES:

- To give an overview of social networks and its importance.
- To understand the social network concepts and various methods of analysis.
- To expose and train on various tools and techniques for analyzing and visualizing social media networks.
- To learn visualization of social networks.
- To understand the concept of semantic web and related applications.

MODULE I     INTRODUCTION TO SOCIAL NETWORKS and SNA     08
Connected World – Networks: Actors, Relations and Attributes - Networks as Information Maps - Networks as Conduits – Leaders and Followers – Psychological foundations of social networks – Basic building Blocks – Brief history of Social Network Analysis.

MODULE II     NETWORK CONCEPTS     08

MODULE III     SOCIAL NETWORK ANALYSIS FUNDAMENTALS     09

MODULE IV     METHODS OF SOCIAL NETWORK ANALYSIS     10

MODULE V     TOOLS AND TECHNOLOGIES     10

Total Hours: 45
TEXT BOOKS AND REFERENCES:


OUTCOMES:

On Completion of the course the students will be able to:

- Understand the theories and concepts of social networks.
- Analyze the social networks by applying various methods of analysis, tools and techniques.
- Use advanced network analysis software to generate visualizations and perform empirical investigations of network data.
- Plan and execute network analytical computations.
- Predict human behavior in social web with related communities and able to visualize social networks.
OBJECTIVES:

- To know about creating and maintaining health care information systems
- To understand the basic concepts of health care system.
- To understand IT governance and assessment of health care information system.
- To understand the predictive analytics in health care.
- To gain insight for making informed healthcare decisions.

MODULE I INTRODUCTION

Introduction to health care information – Health care data quality – Health care information regulations, laws and standards.

MODULE II HEALTH CARE INFORMATION SYSTEMS

History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support.

MODULE III INFORMATION TECHNOLOGY

Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

MODULE IV MANAGEMENT OF IT CHALLENGES

Organizing information technology services – IT alignment and strategic planning – IT governance and management.

MODULE V IT INITIATIVES

Management’s role in major IT initiatives – Assessing and achieving value in health care information systems. Case study

Total Hours: 45
TEXT BOOKS:

REFERENCE BOOKS

OUTCOMES:
On completion of this course, students will be able to:
- Identify, analyze the computing requirements of a problem and Solve them using computing principles.
- Design and Evaluate a computer based system, components and process to meet the specific needs of applications.
- Use current techniques and tools necessary for complex computing practices.
- Use suitable architecture or platform on design and implementation with respect to performance
- Develop and integrate effectively system based components into user environment.
- Apply the understanding of management principles with computing knowledge to manage the projects in multidisciplinary environments.
OBJECTIVE:
In this course the students will learn

- To program in R and to use it for effective data analysis.
- To install and configure software necessary for a statistical programming environment, Generic programming language concepts
- Using R programming in Statistical Inferences
- Machine learning using R.
- To provide an overview of a language R used for data science.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R

MODULE I  INTRODUCTION  09

MODULE II  DATA PREPARATION  09
R Data Frame: Create, Append, Select, Subset- List in R: Create, Select Elements with Example-R Sort a Data Frame using Order() - R Dplyr Tutorial: Data Manipulation(Join) & Cleaning(Spread)- Merge Data Frames in R: Full and Partial Match- Functions in R Programming (with Example).

MODULE III  PROGRAMMING  09
IF, ELSE, ELSE IF Statement in R- For Loop in R with Examples for List and Matrix- While Loop in R with Example- apply(), lapply(), sapply(), tapply() Function in R with Examples- Import Data into R: Read CSV, Excel, SPSS, Stata, SAS Files- How to Replace Missing Values(NA) in R: na.omit& na.rm- R Exporting Data to Excel, CSV, SAS, STATA, Text File- Correlation in R: Pearson & Spearman with Matrix Example- R Aggregate Function: Summarise & Group_by() Example- R Select(), Filter(), Arrange(), Pipeline with Example.
MODULE IV  DATA ANALYSIS  09
Scatter Plot in R using ggplot2 (with Example)- How to make Boxplot in R (with EXAMPLE)- Bar Chart & Histogram in R (with Example)- T Test in R: One Sample and Paired (with Example)- R ANOVA Tutorial: One way & Two way (with Examples).

MODULE V  MACHINE LEARNING  09
R Simple, Multiple Linear and Stepwise Regression [with Example]- Decision Tree in R with Example-R Random Forest Tutorial with Example-Generalized Linear Model (GLM) in R with Example- K-means Clustering in R with Example.

Total Hours: 45

TEXTBOOK:
1. R Programming for Data Science Roger D. Peng 2015 Publisher LeanPub.

REFERENCE BOOKS:

OUTCOMES:
By the end of the class, students learn to:
- Install RStudio, Analyze R documentation, and write R scripts.
- Import, export and manipulate data.
- Generate statistical summaries of continuous and categorical data.
- Implement basic graphics using standard functions, and produce more advanced graphics
- using the lattice and ggplot2 packages.
- Perform common hypothesis tests, run simple regression models in R and create reports of
- statistical analytics in R Markdown.
OBJECTIVES

- Provide an overview of the foundations and key issues of managerial decision making.
- Describe and develop the components and structure of each DSS components
- Understand the different methodologies to develop decision support systems.
- Enable the student to appreciate the role and nature of Group Decision Support Systems and related approaches such as Cognitive Mapping as a means of structuring and supporting complex unstructured decision problems with high levels of uncertainty.
- Understand Enterprise Resource Packages, Supply Chain Management and Customer relationship management systems.

MODULE I  DECISION MAKING AND COMPUTERIZED SUPPORT-1  09

MODULE II  DECISION MAKING AND COMPUTERIZED SUPPORT-2  09
How decisions are supported, Personality types, gender, human cognition, and decision styles; The Decision –Makers. 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, The User Interface Subsystem, The Knowledge-Based Management Subsystem, the User, DSS Hardware, DSS Classification.

MODULE III  DECISION SUPPORT SYSTEMS DEVELOPMENT  09
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.

**MODULE IV GROUP SUPPORT SYSTEMS**  

**MODULE V ENTERPRISE INFORMATION SYSTEMS**  
Concepts and definitions, Evolution of Executive and Enterprise Information Systems, Executive’s roles and information needs, Characteristics and capabilities of Executive Support Systems, Comparing and integrating EIS and DSS, Supply and Value Chains and Decision Support, Supply Chain problems and solutions, MRP, ERP / ERM, SCM, CRM, PLM, BPM, and BAM.

**Total Hours: 45**

**TEXT BOOKS:**

**REFERENCE BOOKS:**

**OUTCOMES:**
**Upon completion of this course student will be able to:**
- Illustrate different types of Decision Making strategies, frame work for decision support.
- Describe DSS characteristics, capabilities and configurations.
- Explain DSS Development Methodology, DSS Technology Levels and Tools.
- Describe the evolution of Executive and Enterprise Information Systems, Executive's roles and information needs, Characteristics and capabilities of Executive Support Systems.
CADY 406  PREDICTIVE ANALYTICS  L T P C  3 0 0 3

OBJECTIVES

- To learn, how to develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines and Bayesian network models.
- To know the use of the binary classifier and numeric predictor nodes to automate model selection.
- To advice on when and how to use each model.
- Learn how to combine two or more models to improve prediction.
- Learn step-by-step and achieve better, more reliable results for managing and coordinating in the analytical process.

MODULE I INTRODUCTION TO DATA MINING  08
Introduction, what is Data Mining? Concepts of Data mining, Technologies Used, Data Mining Process, KDD Process Model, CRISP – DM, Mining on various kinds of data, Applications of Data Mining, Challenges of Data Mining.

MODULE II INTRODUCTION TO ANALYTICS  09

MODULE III DATA UNDERSTANDING AND PREPARATION  10
Introduction, Reading data from various sources, Data visualization, Distributions and summary statistics, Relationships among variables, Extent of Missing Data. Segmentation, Outlier detection, Automated Data Preparation, Combining data files, Aggregate Data, Duplicate Removal, Sampling DATA, Data Caching, Partitioning data, Missing Values.

MODULE IV MODEL DEVELOPMENT & TECHNIQUES  09
MODULE V MODEL EVALUATION AND DEPLOYMENT

Introduction, Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, Metalevel Modeling, Deploying Model, Assessing Model Performance, Updating a Model.

Total Hours: 45

TEXT BOOK:
1. Predictive & Advanced Analytics (IBM ICE Publication).

OUTCOMES:
The students will be able to:
- Understand the process of formulating business objectives, data selection/collection, preparation and process to successfully design, build, evaluate and implement predictive models for a various business application.
- Compare the underlying predictive modelling techniques.
- Select appropriate predictive modelling approaches to identify cases to progress with.
- Apply predictive modelling approaches using a suitable package such as SPSS Modeller.
- Manage and coordinate in the analytical process.
PROGRAMME ELECTIVES

SEMESTER - II

CADY001 MANAGEMENT INFORMATION SYSTEMS  L   T   P   C  
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OBJECTIVES:

- To understand the basic principles of Computer based Information System support the management in the various arena in the business units.
- To get an insight into the various organizational structures, culture and power.
- To 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.
- To provide insights on how to develop and implement enterprise-wide IT strategies, initiatives and programs.
- To explore MIS subsystems and technologies including hardware, software and networking.

MODULE I       SYSTEM CONCEPTS  07

MODULE II       ORGANIZATIONAL STRUCTURE  09
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  10
MODULE IV SYSTEM SUPPORT


MODULE V DEVELOPMENT AND MANAGEMENT

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 BOOK:


REFERENCES:


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.
- Develop various types of Information system suitable for organizational levels and various functional units in the organization.
OBJECTIVES:

• To learn general accounting principles and accounting standards.
• To understand different cost analysis method.
• To introduce knowledge on budget and cash flow analysis.
• To learn investment and financial design model.
• To expose the concepts of working capital management.

MODULE I  FINANCIAL ACCOUNTING  12
Meaning and Scope of Accounting - Principles - Concepts-Conventions- 
accounting Standards - Final Accounts-Trial Balance-Trading Account-Profit 
and Loss Account-Balance Sheet.

MODULE II  COST ACCOUNTING  12
Meaning-Objectives-Elements of Cost-Cost Sheet-Marginal Costing and Cost
Volume Profit Analysis- Break Even Analysis-Applications-Limitations.

MODULE III  MANAGEMENT ACCOUNTING  12
Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production
Budget- Budget-Flexible Budgeting-Cash Budget- Computerized Accounting -
Accounting Ratios Analysis-Funds Flow Analysis-Cash Flow Analysis.

MODULE IV  INVESTMENT DECISION  12
Objectives and Functions of Financial Management - Foreign exchange (Forex) -
Risk - Return Relationship -Time Value of Money Concepts-Capital Budgeting-
Methods of Appraisal.

MODULE V  FINANCING DECISION AND WORKING CAPITAL MANAGEMENT  12
Capital Structure-Factors Affecting Capital Structure-Dividend Policy-Types of
affecting Working Capital-Estimation of Working Capital Requirements

Total Hours: 60
TEXTBOOKS:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Prepare final accounts of a concern to find out the profit or loss
- List the objectives and functions of Financial Management
- Analyze the firm by applying various ratios.
- Perform Computerized Accounting, Accounting Ratios Analysis, Funds Flow Analysis and Cash Flow Analysis
- Analyze the factors affecting a capital structure, working capital and dividends.
OBJECTIVES:
The aim of this course is to make the students understand
- The scope of E-Commerce in the realm of modern business.
- The need for security in E-Commerce.
- The technologies used to develop and deliver E-Commerce applications.
- The marketing methods used in E-Commerce
- The legal and regulatory framework in which e-commerce must operate.

MODULE I  INTRODUCTION

MODULE II  SECURITY TECHNOLOGIES

MODULE III  ELECTRONIC PAYMENT METHODS

MODULE IV  ELECTRONIC COMMERCE PROVIDERS

MODULE V  ONLINE COMMERCE ENVIRONMENTS
Servers and Commercial Environments - Payment Methods - Server Market Orientation - Netscape Commerce Server - Microsoft Internet Servers - Digital Currencies -DigiCash-Using Ecash-Ecash Client Software and Implementation-
Smart Cards - The Chip - Electronic Data Interchange - Internet Strategies, Techniques and Tools.

**Total Hours: 45**

**TEXT BOOK:**

**REFERENCES:**

**OUTCOMES:**
On completion of this course, students will be able to
- Understand E-Commerce concepts and terminology
- Process management decisions that are involved in launching, operating and managing business activity on the World Wide Web.
- use critical thinking, problem-solving, and decision-making skills in evaluating e-commerce technologies;
- Design (plan) a simple e-commerce web site;
- Distinguish various electronics payment methods.
OBJECTIVES:
- To develop a business process strategy to meet stakeholder needs.
- To analyse, improve, design and develop processes to meet stakeholder needs.
- To align technology, organisation, and facilities with the business process strategy and design
- To apply their knowledge to manage process projects effectively.
- To identify, clarify and manage business benefits arising from process change

MODULE I ORGANIZATIONAL STRUCTURE 09

MODULE II ORGANIZATIONAL OUTCOMES 09

MODULE III BUSINESS PROCESS RE-ENGINEERING (BPR) 09

MODULE IV BPR AND IT INDUSTRY 09
MODULE V  E-BUSINESS PROCESS


Total Hours: 45

TEXTBOOKS :

REFERENCES :

OUTCOMES:
On completion of this course, students will be able to
• Form the organizational structure
• Improve leadership quality
• Analyze, improve, design and develop processes to meet stakeholder needs
• Align technology, organization, and facilities with the business process strategy and design
• Apply their knowledge to manage projects effectively.
• Identify, clarify and manage business benefits arising from process change.
OBJECTIVE:

- To provide insight into the architectural implications of Grid Computing
- To provide students with awareness of current issues in skills utilizing current grid tools and technologies.
- To understand architecture of Grid Computing.
- Identifying the weakness of existing tools and technologies and proposing potential areas for improvement.
- Justify the applicability, non-applicability of Grid technologies for a specific Application

MODULE I  INTRODUCTION

MODULE II  TYPES OF GRIDS
Desktop Grids: Background – Definition – Challenges – Technology – Suitability– Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific insight – application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.

MODULE III  ARCHITECTURE AND MANAGEMENT

MODULE IV  NATIVE PROGRAMMING AND SOFTWARE APPLICATIONS
MODULE V APPLICATIONS, SERVICES AND ENVIRONMENTS 09

Total Hours: 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
• Summarize the key concepts of Grid computing.
• Sketch the architecture of open grid services.
• List the needs of grid users and build computer grids.
• Gain a basic knowledge of Data management and transfer in Grid environments and Resource management.
• Prepare for any upcoming Grid deployments and be able to get started with a potentially available Grid setup.
• List the applications of grid computing.
OBJECTIVES:

- Learn and get familiar with the UNIX operating system and UNIX process environment.
- The creation, communication and execution of process are studied with well-defined examples through this course.
- Infer the inter-process communication between similar and different process through standard mechanisms such as pipes, message queue etc.
- Provide a broad knowledge on client server communication using socket across a network for reliable network programming.
- To expose the usage and applications of Unix and network programming.

MODULE I       INTRODUCTION & FILE SYSTEM


MODULE II     PROCESSES


MODULE III    INTERPROCESS COMMUNICATION


MODULE IV    SOCKETS

MODULE V APPLICATIONS 09
Debugging techniques - TCP echo client server - UDP echo client server - Ping - Trace route - Client server applications like file transfer and chat.

Total Hours: 45

TEXT BOOKS:
1. W. Richard Stevens, Advanced programming in the UNIX environment, Addison Wesley, 1999. (Unit 1, 2 & 3)

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Attain the complete knowledge in network communication in UNIX platform.
- List the different types of networking and their functionality
- Summarize the broad knowledge on network details of a system which is configured as UNIX supported components.
- Develop a socket programming for effective client-server communication across a network.
OBJECTIVES

- Learn the basic definitions of algorithmic complexity, and how to analyze the complexity of algorithms.
- Learn basic algorithmic tools used to design efficient algorithms.
- Learn how to design efficient algorithms and to recognize situations where this is not possible.
- Understand the linear and non linear data structures available in solving problems.
- Know about the sorting and searching techniques and its efficiencies.
- Get a clear idea about the various algorithm design techniques.
- Use the data structures and algorithms in real time applications.
- analyze the efficiency of algorithm.

MODULE I  INTRODUCTION

MODULE II  MULTIMEDIA TOOLS

MODULE III  MULTIMEDIA AND THE INTERNET
MODULE IV   ALGORITHM OVERVIEW

MODULE V   2D AND 3D TRANSFORMATIONS

Total Hours: 45

TEXTBOOKS:
1. Multimedia: Making It Work – Tay Vaughan (Unit 1, Unit 2 and Unit 3)

REFERENCE BOOKS:
3. Advanced multimedia programming – Steve Rimmer
4. Multimedia Literacy – Fred T. Hofstetter MG Hill

OUTCOMES:
On completion of this course, students will be able to
- Possess the knowledge of creativity skills with support of multimedia tools
- Gain hands – on experience in image, sound and video editing and in some aspects of multimedia authoring tools
- Design an interactive website for information services
- Analyze and evaluate various algorithms to draw geometrical shapes
- Attain the complete knowledge in graphics & multimedia domain
- Show their proficiency while working with Graphics and multimedia software and tools.
**OBJECTIVE:**

- To impart knowledge on building networks, network layer and software defined networks.
- To understand how network security is conceptualized and carried out.
- To analyze both early and contemporary threats to network security.
- To articulate informed opinion about issues related to network security.
- To appreciate the challenges of network security.

**MODULE I  INTRODUCTION**


**MODULE II  ATTACKS AND PUBLIC KEY ENCRYPTION**


**MODULE III  MESSAGE AUTHENTICATION**

Hash Functions - Digest Functions - Digital Signatures – Authentication Protocols

**MODULE IV  NETWORK SECURITY PRACTICE**


**MODULE V  SYSTEM SECURITY**


**Total Hours: 45**

**TEXT BOOK:**


**REFERENCES:**


OUTCOMES:
On completion of this course, students will be able to

- Master information security governance, and related legal and regulatory issues,
- Master understanding external and internal threats to an organization
- Summarize the basics of network security and attacks.
- Compare various public and private key encryption algorithms.
- Illustrate Message Authentication functions and protocols
- Identify the virus and worms
- List the firewalls design principles
OBJECTIVES:
- To introduce features and technology of microprocessor-based systems like 8085, 8086, etc.
- To gain assembly language programming, interfacing of memory and peripheral devices using 8086.
- To expose the features of advanced Microprocessor like 80386.
- To gain knowledge about the architecture, instruction set, programming, addressing mode interfacing and applications of INTEL 8085, INTEL 8086 and INTEL 80386.
- To learn the applications of Microprocessor by interfacing.

MODULE I INTRODUCTION TO 8085 MICROPROCESSOR

MODULE II INTRODUCTION TO 8086 MICROPROCESSOR
Introduction - 8086 Architecture - 8086 Addressing Modes - 8086 Instruction Set - Data Movement Instructions - Arithmetic and Logic Instructions - Program Control Instructions.

MODULE III 8086 MICROPROCESSOR INTERFACING

MODULE IV 80386 AND PENTIUM MICRO Processors
Introduction to Intel 80386 - Basic Programming model - Memory Organisation - I/O Space - 80386 pins and signals - Bus transfer techniques - 80386 Modes - Introduction to Intel Pentium Microprocessor: Block diagram and Registers.
MODULE V   PERIPHERAL INTERFACING

Keyboard Display Interface-Hex key and display interface to 8085, 8279 Keyboard display controller chip- Printer Interface: LR 7040 Printer interface using 8295 printer controller-CRT controller interface: CRT Fundamentals, 8275 CRT Controller-Coprocessors.

Total Hours: 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to

- Identify different types of memory and describe how each is used
- List microprocessor instruction groups and classify machine instructions accordingly.
- Develop a program in assembly language for the INTEL 8085 and INTEL 8086.
- Analyze (trace) the execution of assembly code programs
- Design interfacing logic to connect external devices to microprocessor.
- Design and develop a microprocessor based system for specific applications.
OBJECTIVES:

- To learn different types of computer networks and understand its OSI model.
- To expose knowledge on different services of internet protocol.
- To learn the services and functions of the protocols of each layer of computer networks.
- To design, build and test a small TCP/IP Network, comprising of three sub networks and two routers.
- To trace and rectify faults on the network.

MODULE I  INTRODUCTION

MODULE II  INTERNET PROTOCOL

MODULE III  TRANSMISSION CONTROL PROTOCOL

MODULE IV  APPLICATION LAYER AND CLIENT SERVER MODEL

MODULE V  APPLICATION PROTOCOLS
Total Hours: 45

TEXT BOOK:

REFERENCE:

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

- Identify the needs and the purpose of each of the protocols at each layer
- Use and configure each of the common applications used with TCP/IP
- Configure a router using static routing and RIP
- Control the server and place request to the server with the support of protocols
- Examine a TCP/IP trace at all levels, and diagnose network problems
OBJECTIVES:

- Understand the fundamental concepts of infrastructure less wireless network
- Learn and analyze the different types of ad hoc routing protocols.
- Understand the working concepts of multicast protocols.
- Learn the need of security in AD Hoc networks.
- Impart knowledge on Providing QoS in Ad Hoc Wireless Networks.

MODULE I

INTRODUCTION


MODULE II

ADHOC ROUTING PROTOCOLS


MODULE III

MULTICAST ROUTING IN ADHOC NETWORKS

Service Guarantees - Application-Dependent Multicast Routing - Comparisons of Multicast Routing Protocols.

**MODULE IV  TRANSPORT LAYER, SECURITY PROTOCOLS  09**

**MODULE V  QoS AND ENERGY MANAGEMENT  09**

**TEXT BOOK:**

**REFERENCES:**

**OUTCOMES:**
At the end of this course students will be able to
- evaluate the performance of different ad hoc routing protocols
- compare and contrast various routing, transport and security protocols.
- Implement simple routing protocol algorithms.
- list the issues and challenges in Providing QoS in Ad Hoc Wireless network.
- classify the QoS solutions and energy management schemes
SEMESTER- IV

CADY 041 DIGITAL IMAGE PROCESSING L T P C 3 0 0 3

OBJECTIVES:
- to cover the basic theory and algorithms that are widely used in digital image processing.
- to expose students with current technologies and issues that are specific to image processing systems.
- to develop hands-on experience in using computers to process image compression and segmentation.
- to develop critical thinking about shortcomings of the state of the art in image processing.
- To represent describe and interpret the objects and images

MODULE I DIGITAL IMAGE FUNDAMENTALS 09

MODULE II IMAGE ENHANCEMENT & RESTORATION 09

MODULE III IMAGE COMPRESSION & SEGMENTATION 09

MODULE IV REPRESENTATION AND DESCRIPTION 09
Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors.

MODULE V OBJECT RECOGNITION AND INTERPRETATION 09
Patterns and pattern classes - Decision-Theoretic methods - Structural methods.

Total Hours: 45
TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- describe how digital images are represented,
- manipulate, encode and process, with emphasis on algorithm design, implementation and performance evaluation.
- analyze various techniques and mention the strength and weakness.
- develop small programs to perform image processing tasks.
- understand the design & specification of multi-dimensional digital filters for image processing applications.
- gain proficiency in using simulation and design software tools, such as those found in Matlab.
OBJECTIVES:

- Provide an overview of data mining and warehousing.
- Introduce data mining techniques and association rules
- Offer adequate knowledge to work with data warehouse and gain knowledge on clustering analysis
- Learn the techniques that can be applied to numerous applications and model the data warehouse
- Apply different data mining tools and their related case studies applied to finance, retail and telecommunications

MODULE I INTRODUCTION


MODULE II ASSOCIATION RULES

Mining Frequent Patterns, Associations and Correlations: Basic Concepts – Frequent Itemset Mining Methods. Classification and Prediction: Issues Regarding Classification and Prediction-Classification by Decision Tree Induction-Bayesian Classification-Other Classification Methods-Prediction.

MODULE III CLUSTERING


MODULE IV DATA WAREHOUSING

MODULE V     APPLICATIONS 09
Social Impacts of Data Mining - Data Mining for Financial Data, Retail and Telecommunications, Science and Engineering, Mining WWW, Mining Text Database – Mining Spatial Databases – Tools - An Introduction to DB Miner - Case Studies

Total Hours: 45

TEXT BOOK:
1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.

REFERENCES :

OUTCOMES:
On completion of this course students will be able to:
- recognize the key areas and issues in data mining
- make more effective use of data stored in databases.
- apply association rules, clustering and classification techniques to the dataset to demonstrate some interesting rules or predict interesting pattern from that.
- compare database and data warehouse.
- manage the data mining development process in an individual or team context
- plan, design and deploy the necessary data mining technologies to support a software system
OBJECTIVES:
- To understand the fundamental concepts of software quality management.
- To acquire the knowledge in quality analysis tools and techniques with configuration management.
- To have the exposure on software quality assurance standards, quality measures and quality control.
- To test plan and develop the quality software and maintain them.
- To introduce philosophies and strategies to quality related issues based on defect detection and prevention.

MODULE I | INTRODUCTION
Software Process assessment overview - Assessment phases - Assessment principles - Assessment conduct - Implementation consideration - Quality management - Quality assurance plan - Considerations – Verification and Validation.

MODULE II | CONFIGURATION MANAGEMENT

MODULE III | SOFTWARE STANDARDS AND INSPECTION
Definitions - Reason for software standards - Benefits - Establishing standards - Guidelines - Types of reviews - Inspection of objectives - Basic inspection principles - The conduct of inspection - Inspection training.

MODULE IV | TESTING AND MANAGING SOFTWARE QUALITY
MODULE V  DEFECT PREVENTION  09

Total Hours: 45

TEXT BOOK :

REFERENCES :

OUTCOMES:
At the end of this course, the students will be able to
- describe the various practices available to manage a software system.
- understand software quality management problems, general solutions, technologies and standards
- compare and contrast product quality and process quality.
- apply product and process quality control techniques
- define, implement, and apply software (process) metrics apply software quality management to software and software development processes
OBJECTIVES:

- To provide a clear understanding on the basic concepts, building blocks for Embedded System
- To introduce the concepts of memory and Input/Output management activities
- To teach the fundamentals of processes and scheduling policies.
- To teach how to program embedded systems in assembly language and
- To introduce on Embedded Process development Environment with related case studies

MODULE I  EMBEDDED COMPUTING 09

MODULE II  MEMORY AND INPUT / OUTPUT MANAGEMENT 09
Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupts handling.

MODULE III  PROCESSES AND OPERATING SYSTEMS 09
Multiple tasks and processes – Context switching – Scheduling policies – Inter process communication mechanisms – Performance issues

MODULE IV  EMBEDDED SOFTWARE 09
Programming embedded systems in assembly and C – Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers.

MODULE V  EMBEDDED SYSTEM DEVELOPMENT 09
Design issues and techniques – Case studies – Complete design of example embedded systems.

Total Hours: 45
TEXT BOOKS

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- identify different families and architectures of Embedded System tools such as Microcontrollers, DSPs, FPGAs etc.
- analyze real-time scheduling algorithms and identify design flaws.
- design any embedded system (h/w or s/w or both) based on any of the above tools.
- Implement the Embedded Software particularly in real-time systems with Industry standard RTOS such as VxWorks and RT Linux
OBJECTIVES:

- To give an overview of business and project planning.
- To introduce and explain the complexity of business intelligence decision support projects.
- To present a step-by-step guide for the entire Business Intelligence project life cycle.
- To impart knowledge of a complete development lifecycle including activities, deliverables, roles, risks, responsibilities, Do's and Don'ts, entry and exit criteria for a successful Business Intelligence (BI) decision support implementation.
- To introduce the various application development activities with tools and mining.

MODULE I STAGES AND STEPS 09

MODULE II ENTERPRISE INFRASTRUCTURE EVALUATION 09

MODULE III PROJECT PLANNING 09
Project Planning – Managing, Defining, Planning the BI Project - Project Planning Activities – Deliverables Roles and Risks - Project Requirements Definition – General Business and Project-Specific Requirements – The Interviewing Process – Project Requirements and Deliverables – Roles and Risks involved - Data Analysis –

**MODULE IV DATABASE DESIGN**


**MODULE V APPLICATION DEVELOPMENT**


**TEXT BOOK:**


**REFERENCE:**


**OUTCOMES:**

On completion of this course, students will be able to

- describe the infrastructure components of BI decision support system.
- build prototype for developing a successful project
- evaluate enterprise infrastructure
- define, compare and implement physical and logical database design
- determine number of resources required, type of resources in terms of both technical and human and could be able to recognize the components that impairs the success of BI decision support application
OBJECTIVES

- To introduce the Fundamentals of testing
- To teach the Role of Testing in Software Development Lifecycle and its various types
- To explain the Various techniques of testing with branch and statement coverage with tool support
- To introduce the Test organisation activities along with stress and security
- To teach Tools for testing activities like dynamic and non-functional testing

MODULE I  FUNDAMENTALS OF TESTING  09

MODULE II  ROLE OF TESTING IN SDLC  09

MODULE III  APPROACHES TO TESTING  09
Black Box Testing- Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques: White Box Testing-Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support Gray Box Testing, Intuitive and Experience Based Testing.

MODULE IV  TEST ORGANIZATION  09

MODULE V  TESTING TOOLS  09

Total Hours: 45

REFERENCES:
6. The art of software testing by GJ Myers, Wiley.

OUTCOMES
On completion of this course, students will be able to
- recognize the need for testing
- review various software development models like Waterfall Models, Spiral Model, W Model and V Model
- perform various testing like black box testing, white box testing, gray box testing and Experience Based Testing
- describe the various testing techniques
- work with various test tools
- apply the testing techniques in commercial environment
OBJECTIVES

- To impart knowledge in installing CMS and how CMS differ from website builder
- To introduce the design layout and create the functionality with correct permissions
- To train the student on the e-commerce workshop and trouble shooting
- Provide knowledge on the core modules, using Smarty to build templates with own functionality
- To train the students in using an open source content management (CMS) tool – Joomla, A powerful and robust tool

MODULE I   INTRODUCTION


MODULE II   DESIGN AND FUNCTION

Design and Layout - Using Core modules – Users and Permissions – Using Third-party Modules – Creating Own Functionality.

MODULE III WORKSHOP AND TROUBLESHOOTING

E-commerce workshop - Advanced Use of CMS - Administration and Trouble Shooting.

MODULE IV   WEB PAGE ADMINISTRATION

Introduction to dynamic web pages and development tools for dynamic content– Downloading tools for dynamic content – Downloading and installing a content Management System (Joomla!) – Administration elements of a Content Management System – Organizing Content.

MODULE V   CASE STUDY

Basic elements: pages, menus and navigation – incorporate components, modules, plug-ins and languages – Case Studies: Marketing strategies and planning for websites – Design and create a school website, restaurant website, blog site, Securing Content Management System.
TEXT BOOKS:
1. CMS Made simple 1.5, Sofia Hauschildt, 2010

OUTCOMES:
On completion of this course, students will be able to
- install CMS made simple (CMSMS), Converting other website templates to work with CMSMS
- add a e-commerce functionality and a discussion of users and permissions
- develop a successful website powered by Joomla
- list the advanced use of CMS
- incorporate components, modules, plug-ins and languages
CADY 048       ADVANCED PROGRAMMING TECHNIQUES          L T P C
                                            3 0 0 3

OBJECTIVES:

- Comprehend the concepts of C and C++
- Obtain the knowledge on advanced Java programming concepts like interface, threads, Swings etc.
- Apply java programming concepts in writing network programs, RMI, CORBA, and threading
- To learn the fundamentals of multi-tier application development activities with JDBC and other applications
- Apply and analyze issues in enterprise applications development

MODULE I       C FUNDAMENTALS


MODULE II       C++ FUNDAMENTALS

C++ Overview - Functions and Variables - Classes in C++ - Operator Overloading - Storage Management - Inheritance - Polymorphism - Exceptions - Templates.

MODULE III       JAVA PROGRAMMING


MODULE IV       MULTI-TIER APPLICATION DEVELOPMENT

MODULE V ENTERPRISE APPLICATIONS


Total Hours: 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- apply the basic and advanced concepts of programming languages such as C, C++ and Java in developing application
- connect the java application with backend database and manipulate the data stored in the database.
- invoke and execute the methods of the remote object using RMI
- summarize various Enterprise JavaBean (EJB) concepts including entity beans, session beans, bean managed persistence (BMP), and container managed persistence (CMP)
- perform database queries and updates using JDBC
Cady 049  Information and Storage Management  L T P C
3 0 0 3

Objectives
- Describe and apply storage technologies
- Understand logical and physical components of a storage infrastructure
- Identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centres
- Describe important storage technologies’ features such as availability, replication, scalability and performance
- Discuss the types of storage virtualization

Module I  Introduction to Storage Technology  09
Data creation and the value of data to a business, Information Life cycle, Challenges in data storage and data management, Solutions available for data storage, Core elements of a Data Centre infrastructure, role of each element in supporting business activities.

Module II  Storage Systems Architecture  09
Hardware and software components of the host environment, Key protocols - Physical --logical components of a connectivity environment -Major physical components- logical constructs of a physical disk- access characteristics-performance Implications- Concept of RAID and its components, Different RAID levels -high-level architecture and working of an intelligent storage system.

Module III  Introduction to Networked Storage  09
Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfil the need, Understand the appropriateness of the different networked storage options for different application environments.

Module IV  Monitoring & Managing Data Center  09
Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure - solutions to mitigate these failures- Architecture of
backup/recovery - recovery topologies - replication technologies - ensuring information availability and business continuity - Remote replication technologies - providing disaster recovery - business continuity capabilities - Key areas to monitor in a data center - Key metrics to monitor storage infrastructure.

MODULE V  SECURING STORAGE AND STORAGE VIRTUALIZATION  09
Information Security, Critical security attributes for information systems, Storage security domains, Analyze the common threats in each domain. Storage Virtualization: Forms, Configurations and Challenges. Types of Storage Virtualization: Block-level and File-Level.

TEXT BOOK & REFERENCES

OUTCOMES
After completion of this course, the students would be able to
- identify different types of storage media for digital data.
- understand computer terminology as it applies to data storage.
- differentiate between different types of data storage systems.
- select different data storage types appropriate for various GIS system data.
- recognize the differences between the data in a GIS system and the real world it represents.
- recognize the importance of data design in a GIS system.
OBJECTIVES

- understand the need of semantic web in web services
- know the methods to discover, classify and build ontology for more reasonable results in searching
- to build and implement a small ontology that is semantically descriptive of chosen problem domain
- to learn different web ontology languages along with data types and assertions
- implement applications that can access, use and manipulate the ontology

MODULE I     INTRODUCTION


MODULE II    ONTOLOGICAL ENGINEERING


MODULE III    STRUCTURING AND DESCIBING WEB RESOURCES

MODULE IV WEB ONTOLOGY LANGUAGE

MODULE V SEMANTIC WEB TOOLS AND APPLICATIONS

Total Hours: 45

TEXT BOOK & REFERENCE BOOKS:
OUTCOMES:
On completion of this course, students will be able to
- Comprehend the semantic web basics and sketch the architecture diagram of semantic web.
- Identify the component technologies of the Semantic Web and explain their roles.
- Represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology.
- Illustrate the semantic relationships among these data elements using Resource Description Framework (RDF).
- List the limitations of semantic web technologies and aware of the services it can and cannot deliver.
- Discover the capabilities and limitations of semantic web technology for social networks.
OBJECTIVES:

- To describe the concept of ERP and the ERP model
- To explain how ERP is used to integrate business processes and analyze a process
- To impart the key technological considerations and infrastructure concerns in ERP implementation
- To describe project organizational considerations define the project management tools and resources needed to implement an ERP system
- To impart the basic architectural concepts services and interfaces

MODULE I  INTRODUCTION TO ERP  09

MODULE II  BUSINESS MODELLING FOR ERP  09

MODULE III  ERP AND THE COMPETITIVE ADVANTAGE  09

MODULE IV  COMMERCIAL ERP PACKAGE  09
Description – Multi-Client Server Solution – Open Technology – User Interface-Application Integration.
MODULE V  ARCHITECTURE  09

Total Hours: 45

TEXT BOOK:

REFERENCE:

OUTCOMES:
On completion of this course, students will be able to
- List the steps and activities in the ERP life cycle;
- articulate the challenges associated with post-implementation and management of ERP systems.
- evaluate the progress of an ongoing ERP implementation project.
- apply modern software including Oracle ERP system to plan and manage resources in organizations.
- examine systematically the planning mechanisms in an enterprise
- identify all components in an ERP system and the relationships among the components.
OBJECTIVES:

- To understand the concepts of Software project management.
- To know the techniques in developing Quality Software Products, approaches in WBS and building them.
- To manage the Software Product Development with various models like CMM, COCOMO and mathematical model.
- To frame various scheduling activities with PERT and CPM and critical chain scheduling.
- To study the various tools, guidelines and legal issues along with the case study of a project.

MODULE I  INTRODUCTION 09

MODULE II  DOMAIN PROCESSES 09

MODULE III  SOFTWARE DEVELOPMENT 09

MODULE IV  SCHEDULING ACTIVITIES 09
MODULE V   QUALITY ASSURANCE


Total Hours: 45

TEXT BOOK :


REFERENCES :


OUTCOMES:

On completion of this course, students will be able to

- gain Knowledge to develop Quality Software Products.
- plan, organize and manage the various resources effectively to achieve.
- specific target in a software organization.
- list the tasks and activities involved in the software development.
- differentiate PERT and CPM in project management.
- handle Software projects effectively.
SEMESTER V

CADY 071 UNIX INTERNALS L T P C
3 0 0 3

OBJECTIVES:

- To provide in-depth knowledge of the UNIX Operating system
- To familiarize students with the concepts, design and structure of the UNIX operating system
- To provide UNIX operating system’s internal features and their operation
- To teach students the principles of UNIX shell programming
- To describe the data structures, their relationships and the major algorithms used to manage System, processes, system calls, interrupts and exceptions, virtual memory and file systems

MODULE I INTRODUCTION TO UNIX


MODULE II FILE SYSTEMS

INODES - Structure of a regular file- Directories – Conversion of a path name to an INODE - Super Block- INODE assignment – Disk Blocks- System calls for the file system.

MODULE III PROCESSES


MODULE IV MEMORY MANAGEMENT

Swapping – Segmentation - Demand Paging – Driver Interfaces – Disk Drivers – Terminal Drivers - Streams.
MODULE V  INTERPROCESS COMMUNICATION  09

Total Hours: 45

TEXT BOOK :

REFERENCES :

OUTCOMES:
On completion of this course, students will be able to
- Work with the basic functioning of UNIX operating systems
- Write shell programming and convert pathname to an INODE
- Analyze the buffers and kernel representation, to understand the UNIX system structure and system calls
- Compare the various memory management techniques like Swapping, Segmentation and Demand Paging
CADY 072 ADVANCED DATABASES

OBJECTIVES:

- To use concepts and DBMS features learned previously
  - To be familiar with data modelling and able to apply the techniques to medium complexity problems
- To be proficient with basic SQL and familiar with advanced usage
- To be exposed to database administration
- To be familiar with OBDC and Web site use of databases

MODULE I RELATIONAL DATABASES
Relational Model - Querying - Storage Structures - Query Processing- Normalization.

MODULE II OBJECT ORIENTED DATABASES
Introduction to Object Oriented Data Bases - Approaches - Modelling and Design - Persistence - Transaction - Concurrency - Recovery - Database Administration.

MODULE III EMERGING SYSTEMS
Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases – Mobile Databases.

MODULE IV CURRENT ISSUES
Rules - Knowledge Bases - Active and Deductive Databases - Distributed Databases and Parallel databases.

MODULE V DATABASE DESIGN ISSUES
Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues.

Total Hours: 45

TEXT BOOK :
REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
  • Discuss the concepts of transaction management.
  • Design high-quality relational databases and database applications.
  • Develop skills in advanced visual & conceptual modelling and database design.
  • Translate complex conceptual data models into logical and physical database designs.
OBJECTIVES:
- To understand the fundamental concepts of quality assurance, SQA activities and SQA metrics
- To get an insight into the various quality control tools
- To explore the guidelines prescribed by the various quality standards like CMMI
- To investigate the techniques and tools for software testing
- To understand about various review techniques

MODULE I  CONCEPTS  09

MODULE II  SOFTWARE ENGINEERING CONCEPTS  09

MODULE III  QUALITY ASSURANCE MODELS  09

MODULE IV  SOFTWARE QUALITY ASSURANCE RELATED TOPICS  09
Software Process - Definition and implementation; internal Auditing and Assessments; Software testing -Concepts, Tools, Reviews, Inspections & Walk thoughts; P-CMM.

MODULE V  FUTURE TRENDS  09
PSP and TSP, CMMI, OO Methodology, Clean-room software engineering, Defect injection and prevention.

Total Hours: 45
TEXT BOOK:

REFERENCES:

OUTCOMES:
At the end of this course, the students will be able to
• Apply software quality control tools.
• Identify the software quality attributes and explore the quality standards.
• Apply software testing techniques and identify the inputs and deliverables of testing.
• Evaluate how new technologies impact software quality assurance and the system’s development life cycle.
OBJECTIVES:
- To gain an understanding of the basic principles of service orientation
- To learn service-oriented analysis techniques
- To interpret technology underlying the service design
- To learn advanced concepts such as service composition, orchestration and Choreography
- To know about various WS specification standards
- To introduce the fundamentals and issues relating to Service Oriented Architecture
- To bring out the importance of service orientation and web services

MODULE I  INTRODUCTION

MODULE II  SERVICE LAYER

MODULE III  SERVICE ORIENTED ANALYSIS AND DESIGN

MODULE IV  TECHNOLOGIES AND DESIGN FOR SOA
SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services

**MODULE V  SERVICE DESIGN AND SECURITY  09**

**Total Hours: 45**

**TEXT BOOK:**

**REFERENCES:**

**OUTCOMES:**
On completion of this course, students will be able to
- Recall the principles of service orientation.
- Differentiate service composition, orchestration and Choreography.
- Develop ASP.NET web services.
- Apply the tools and technique for Service Oriented Architecture.
- build an SOA platform supported by J2EE and .NET
LEARNING OBJECTIVES:

- Teach the fundamental skills that are required to design and develop object-oriented applications
- Train the students to program in C# and develop .NET applications using C#
- Access data using ADO.NET
- To create dynamic web pages using the .NET framework
- Utilize XML in the .NET environment to create Web Service-based applications and components

MODULE I  INTRODUCTION TO C#  09
Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

MODULE II  OBJECT ORIENTED ASPECTS OF C#  09
Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

MODULE III  APPLICATION DEVELOPMENT ON .NET  09
Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, Data Set, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

MODULE IV  WEB BASED APPLICATION DEVELOPMENT ON .NET  09
Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session
management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

**MODULE V  CLR AND .NET FRAMEWORK**

Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET.

**Total Hours: 45**

**TEXT BOOKS:**


**REFERENCES:**


**OUTCOMES:**

On completion of this course, students will be able to

- List the major elements of the .NET framework
- Analyze the basic structure of a C# application
- design, run and debug simple C# console applications
- implement methods, classes, encapsulation, constructors, overloading, inheritance and polymorphism to develop C# programs
- Design and develop windows and web based applications on .NET
- Access data from the database with ADO.NET
OBJECTIVES:

- To learn how to build good web applications using PHP language
- To know the in-depth knowledge about dynamic response
- To gain ability to develop dynamic web applications
- To install PHP and work with arrays and regular experiment
- To handle the exceptions and file operations

MODULE I INTRODUCTION TO PHP

PHP installation and Introduction, Syntax, Variables-Data types- Operators and expressions-Decisions and Loops-Function- Arrays with attributes-Creating and String- String related Library functions- Regular Expression.

MODULE II ADVANCED PHP

Introduction to OOPS- Class- methods- Constructors and Destructors, Access Modifiers-Inheritance-Abstract class-Interface-Error and Exceptional Handling-File Handling-PHP date and time.

MODULE III PHP FORMS AND IMAGES

Form Handling –PHP Interactive Forms-PHP GET & POST-Form Validation-PHP Form sanitization-PHP Form URL/E-mail –Basics of Computer Graphics-Creating Image-Manipulating Image-Using Text in Image-Watermarks to Image.

MODULE IV PHP WITH MYSQL AND CMS


MODULE V PHP APPLICATION FRAMEWORKS


Total Hours: 45
TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- Design a web project to use real-time processing capabilities to interact with a database.
- test and debug a php application
- apply the Model View controller pattern for web applications
- pass information from client browser to web server for transaction processing
- able to send email directly from a script
- work with Yii, a high-performance PHP framework for developing Web 2.0 applications.
OBJECTIVES:

- provide an understanding of the Internet as an advertising and the process of selling an online ad program
- know the trends and issues concerning the current and evolving forms of Internet-based advertising and brand communication media;
- provide an overview of the processes and elements considered in the Conceptualizing and production of integrated brand communication campaigns
- To understand about global marketing and advertising
- Learn how online ads are priced and delivered, along with key Measurement metrics.

MODULE I ONLINE ADVERTISING 09
Internet advertising- Definition-Advantage-Players in the Internet advertising Industry-Online Ad models-Advertising via email-web-testing-buttons-text links-sponsorships-push technology-Interstitials-screensavers-bookmarks-cursors-Undervalued web space.

MODULE II TARGETING APPROACHES 09
A Unique Element in Online Advertising-Demographic Targeting -Contextual Targeting-Behavioral Targeting-Geographic Targeting -Affinity Targeting - Purchase-Based Category Targeting-Key Considerations in Online Targeting - Direct Email-Banner Advertising-Mini-page-Direct response piece-Loyalty programs-coupons-free samples-trials-contests and games.

MODULE III DISPLAY ADVERTISEMENT ONLINE 09
Standard Online Advertising Formats-Creative Factors That Influence Display Advertising -Effectiveness-Rich Media Advertising on Broadband-Online Video Advertising Online Advertising Reach and Frequency Concepts-Strategies for Managing Online Reach and Frequency- Frequency of Online Advertising-Reach and Site Visiting-Winning Strategies in Online Advertising -Generate Leads and Acquire Customers-Generate Brand Preference to Stimulate Sales -Brand Growth, Rewards, and Loyalty
MODULE IV  WEB MEASUREMENT  09

MODULE V  BUYING AND SELLING ONLINE ADS  09
Buying Online Ads-Determine campaign goals-Site selection process – Paying for Media buys-Pricing for buys-Allocating campaign budget - Selling Online Advertising-Preparing site’s infrastructure-Monitoring and measuring traffic-Ad models-Ad management-Auditing-Media kit- selling strategies-Sales Staff

Total Hours: 45

TEXT BOOKS

OUTCOMES
Students who complete this course will be able to
• Explore and discuss the important issues in Internet brand communications in general and advertising.
• develop, promote, and manage Internet-based integrated communication campaigns
• list the problems with web measurement
• Identify the steps involved in digital campaign planning
OBJECTIVES:

- To provide students with a sound basis in Web data mining tasks and techniques.
- To ensure that students are able to implement and to use some of the important Web mining algorithms.
- Gain experience of doing independent study and research
- To evaluate Web Mining techniques in their workplace.
- Develop skills of using recent data mining software for solving practical problems of Web Mining

MODULE I  INTRODUCTION TO WEB INTELLIGENCE       09

MODULE II  WEB USAGE MINING                           09

MODULE III  WEB CONTENT MINING                         09
Introduction - Data Collections - Search Engines - Robot Exclusion - Personalization of Web Content - Multimedia Information Retrieval.

MODULE IV  WEB STRUCTURE MINING                        09
Introduction - Modelling Web Topology - Other Approaches to Studying the Web-Link Structure

MODULE V  WEB MINING APPLICATIONS                     09
Data integration for e-commerce - Web personalization - Web content and structure mining - Web data warehousing - Review of tools, applications, and systems

Total Hours: 45

TEXTBOOKS:


OUTCOMES:

Students who complete this course will be able to

- index search engines and rank web documents.
- Identify the different components of a page that can be used for mining.
- conduct business intelligence from online resources.
- apply Web Mining strategies and algorithms in their workplace or research careers.
- analyze social media data using appropriate web mining techniques
- modify an existing search engine to make it personalized.
OBJECTIVES:

- To learn how to take a systematic approach to develop a Digital Marketing strategy
- To designing an online marketing strategy integrated with overall marketing objectives
- To learn to use email marketing as an effective marketing channel
- To learn global strategy in digital marketing
- To learn all the essentials of mobile marketing

MODULE I DIGITAL MARKETING


MODULE II BUILDING WEBSITE AND SEARCH ENGINE OPTIMIZATION


MODULE III ONLINE DISPLAY ADVERTISING AND ECOMMERCE 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 09
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 09
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

REFERENCES:
1. Wayne L.Winston, Marketing Analytics: Data driven techniques and Microsoft Excel
2. Calvin Jones : The best digital marketing campaigns in the world , Mastering The Art of Customer Engagement
3. Jan Zimmerman – Social media marketing all in one for dummies
4. Leon G.Schiffman –Consumer Behavior
5. Chaffey Et Al E marketing Excellence: Planning and Optimizing your digital marketing , 4Ed
6. Alan Charles worth Digital Marketing: A Practical Approach

OUTCOMES:
At the end of this course the 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
- Work with a digital marketing tool kit
- Become familiar with the elements of the digital marketing plan
- Reach the online target market and develop basic digital marketing objectives
- collect, process, and analyze consumer data to make informed marketing decisions
- develop marketing strategies based on product, price, place and promotion objectives
OBJECTIVES:

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

MODULE I INTRODUCTION 09
Introduction - History of IR - Components of IR - Issues - Open source Search engine frameworks - The impact of the web on IR - The role of artificial intelligence (AI) in IR - IR Versus Web Search - Components of a Search engine - Characterizing the web.

MODULE II INFORMATION RETRIEVAL 09

MODULE III WEB SEARCH ENGINE - INTRODUCTION AND CRAWLING 09

MODULE IV WEB SEARCH - LINK ANALYSIS AND SPECIALIZED SEARCH 09
Link Analysis - hubs and authorities - Page Rank and HITS algorithms - Searching and Ranking - Relevance Scoring and ranking for Web - Similarity - Hadoop & Map Reduce - Evaluation - Personalized search - Collaborative filtering and content-based recommendation of documents and products - handling “invisible” Web - Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.
MODULE V   DOCUMENT TEXT MINING

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

Total Hours: 45

TEXT BOOKS:


REFERENCES:


OUTCOMES:

On Completion of the course the students will be able to

- Apply information retrieval models
- Design Web Search Engine
- Use Link Analysis
- Use Hadoop and Map Reduce
- Apply document text mining techniques
OBJECTIVES
- Determine the need for computers and evaluate the use of computers,
- identify the stages in software engineering that need to be modified for the effectiveness of interacting with computers,
- discover the various models that can be used for designing systems, evaluate the design techniques by applying the apt statistical approach, and design dialogue for representation to computers
- Understand the important aspects of the implementation of human-computer interfaces
- Identify the impact of usable interfaces in the acceptance and performance utilization of information system

MODULE I DESIGN PROCESS

MODULE II DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS
The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, - Principles of user interface. Design rules – maximum usability – Principles – Standards and guidelines – design patterns –

MODULE III SOFTWARE TOOLS AND COMPONENTS

MODULE IV MODELS
technical models – Communication and Collaboration models – Task models – Task analysis and design.

**MODULE V  EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI**


Total Hours: 45

**TEXT BOOKS:**

3. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.

**REFERENCES**

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL EALG, PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,

**OUTCOMES**

On completion of this course, students will be able to

- Explain Computer components functions regarding interaction with human
- Demonstrate Understanding of Interaction between the human and computer components.
- Implement Interaction design basics
- Use HCI in the software process
- Apply Design rules
- Use Evaluation techniques
OBJECTIVES:
The aim of the course is to

- Provide an introduction to what bioinformatics is and why it is important
- Provide an overview of the application areas of bioinformatics
- Let the students know the recent evolution in biological science.
- To know how to extract a DNA sequence
- To know how bioinformatics data is stored and organised

MODULE I  INTRODUCTION

MODULE II  ALIGNMENTS

MODULE III  PHYLOGENETICS

MODULE IV  GENE STRUCTURE

MODULE V  PROTIENS AND PREDICTION
experimental techniques – inhibitors and drug designing and screening – NMR structures – empirical methods and prediction techniques – post-translational modification prediction

Total Hours : 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of this course, students will be able to
- develop bioinformatics tools with programming skills.
- apply computational based solutions for biological perspectives.
- pursue higher education in this field.
- practice life-long learning of applied biological science.