B.S. Abdur Rahman Crescent Institute of Science & Technology

Deemed to be University u/s 3 of the UGC Act, 1956

Regulations 2019
Curriculum and Syllabi

(Amendments updated upto June 2020)

M.C.A
(Master of Computer Applications)

B.S. Abdur Rahman Crescent Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

REGULATIONS 2019

CURRICULUM AND SYLLABI

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 **v**alid 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.

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

REGULATIONS - 2019 FOR

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

(Under Choice Based Credit System)

1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE

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

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

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

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

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

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

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

2.0 PROGRAMMES OFFERED AND ADMISSION REQUIREMENTS

2.1 Programmes Offered

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

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

2.2 ADMISSION REQUIREMENTS

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

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

3.0 DURATION, ELIGIBILITY AND STRUCTURE OF THE PROGRAMME

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

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

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

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

3.2 ELIGIBLE ENTRY QUALIFICATIONS FOR ADMISSION TO PROGRAMMES

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

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

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

3.3. STRUCTURE OF THE PROGRAMME

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

the respective curriculum

i. Core courses
ii. Elective courses
iii. Laboratory oriented core courses
iv. Project work / thesis / dissertation
v. Laboratory Courses
vi. Seminars
vii. Mini Project
viii. Industrial Internship
ix. Value Added Courses
x. MOOC Courses (NPTEL, SWAYAM, etc.,)

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

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

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

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

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

- One credit for one lecture period per week or 15 periods of lecture per semester
- One credit for one tutorial period per week or 15 periods per semester
- One credit each for seminar/practical session/project of two or three periods per week or 30 periods per semester
- One credit for four weeks of industrial internship or 160 hours per semester.

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

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

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

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

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

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

3.4. ONLINE COURSES

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

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

3.5 PROJECT WORK / DISSERTATION

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

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

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

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

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

4.0 CLASS ADVISOR AND FACULTY ADVISOR

4.1 CLASS ADVISOR

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

4.2 FACULTY ADVISOR

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

5.0 CLASS COMMITTEE

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

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

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

ii) Faculty members of all courses of the semester

iii) All the students of the class

iv) Faculty advisor and class advisor

v) Head of the Department – Ex officio member

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

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

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

6.0 COURSE COMMITTEE

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

7.0 REGISTRATION AND ENROLLMENT

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

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

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

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

8.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

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

9.0 MINIMUM REQUIREMENTS TO REGISTER FOR PROJECT / DISSERTATION

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

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

9.2 If the student has not earned minimum number of credits specified, he/she

has to earn the required credits, at least to the extent of minimum credits specified in clause 9.1 and then register for the project semester.

10.0 ATTENDANCE

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

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

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

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

11.0 REDO COURSES

11.1 A student can register for a maximum of two redo courses per semester in the evening after regular working hours, if such courses are offered by the concerned department. Students may also opt to redo the courses offered during regular semesters, without affecting the regular academic schedule

and not exceeding prescribed maximum credits.

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

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

12.0 ASSESSMENTS AND EXAMINATIONS

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

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

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

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

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

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

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

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

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

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

13.0 SUBSTITUTE EXAMINATIONS

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

by a committee constituted by the Head of the Department / Dean of School for that purpose. However there is no substitute examination for semester end examination.

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

14.0 SUPPLEMENTARY EXAMINATION

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

15. PASSING, DECLARATION OF RESULTS AND GRADE SHEET

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

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

"W" denotes withdrawal from the course.

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

"U" denotes unsuccessful performance in the course.

"AB" denotes absence for the semester end examination.

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

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

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

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

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

If C_i, is the number of credits assigned for the i^{th} course and GP_i is the Grade Point in the i^{th} course

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

Where n = number of courses

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

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

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

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

Percentage Equivalent of Marks = CGPA X 10

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

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

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

16.0 DISCIPLINE

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

to affect the reputation of the Institution.

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

17.0 ELIGIBILITY FOR THE AWARD OF THE MASTERS DEGREE

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

i. Successfully acquired the required credits as specified in the curriculum corresponding to his/her programme within the stipulated time.
ii. No disciplinary action is pending against him/her.
iii. Enrolled and completed at least one value added course.
iv. Enrollment in at least one MOOC / SWAYAM course (non-credit) before the final semester.

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

18.0 POWER TO MODIFY

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

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

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

CURRICULUM

Sl. No	Course Code	Course Title	L	T	P	C
		SEMESTER 1				
1	MAD 6186	Discrete Mathematics	**3**	**1**	**0**	**4**
2	CAD 6101	Programming in C and C++	**3**	**1**	**0**	**4**
3	CAD 6102	Computer Organization	**3**	**0**	**0**	**3**
4	CAD 6103	Database Management Systems	**3**	**0**	**0**	**3**
5	CAD 6104	Computer Networks	**3**	**0**	**0**	**3**
6	CAD 6105	C and C++ Programming Laboratory	**0**	**0**	**4**	**2**
7	CAD 6106	DBMS Laboratory	**0**	**0**	**4**	**2**
						21
		SEMESTER 2				
1	CAD 6201	Computer Graphics and Multimedia Systems	**3**	**0**	**1**	**4**
2	CAD 6202	Probability and Statistics	**3**	**1**	**0**	**4**
3	CAD 6203	Algorithm Analysis and Data structures	**3**	**1**	**0**	**4**
4	CAD 6204	Operating Systems	**3**	**0**	**0**	**3**
5		Programme Elective-1	**3**	**0**	**0**	**3**
6	CAD 6205	Algorithm Analysis and Data structures Laboratory	**0**	**0**	**4**	**2**
7	CAD 6206	Operating Systems Laboratory	**0**	**0**	**4**	**2**
8	CAD 6207	Communication Skills Laboratory	**0**	**0**	**2**	**1**
						23

Sl. No	Course Code	Course Title	L	T	P	C
		SEMESTER 3				
1	CAD 7101	Object Oriented Software Engineering	**3**	**0**	**1**	**4**
2	CAD 7102	Internet and Java Programming	**3**	**0**	**0**	**3**
3	MAD 6187	Resource Management Techniques	**3**	**1**	**0**	**4**
4	CAD 7103	Cloud Computing	**3**	**0**	**0**	**3**
5	CAD 7104	Mobile Application Development	**3**	**0**	**0**	**3**
6	CAD 7105	Introduction to Data Science	**3**	**0**	**0**	**3**
7	CAD 7106	Advanced Technology Laboratory (Cloud/Mobile/Data Science)	**0**	**0**	**4**	**2**
8	CAD 7107	Programming in JAVA	**0**	**0**	**4**	**2**
						24
		SEMESTER 4				
1	CAD 7201	Advanced Web Design and Development	**3**	**0**	**0**	**3**
2	CAD 7202	XML and Web Services	**3**	**0**	**0**	**3**
3	CAD 7203	Machine Learning Techniques	**3**	**1**	**0**	**4**
4		Technology Elective -1	**3**	**0**	**0**	**3**
5		Programme Elective-2	**3**	**0**	**0**	**3**
6	CAD 7204	Web design and development Laboratory	**0**	**0**	**4**	**2**
7	CAD 7205	XML and Web Services Laboratory	**0**	**0**	**4**	**2**
8	CAD 7206	Soft Skills and Personality Development	**0**	**0**	**2**	**1**
						21

Sl. No	Course Code	Course Title	L	T	P	C
		SEMESTER 5				
1	CAD 8101	Python Programming	**3**	**0**	**0**	**3**
2	CAD 8102	Internet of Things	**3**	**0**	**1**	**4**
3	CAD 8103	Big data and its analytics	**3**	**0**	**0**	**3**
4	CAD 8106	Social Entrepreneurship	**3**	**0**	**0**	**3**
5		Technology Elective – 2	**3**	**0**	**0**	**3**
6		Programme Elective - 3	**3**	**0**	**0**	**3**
7	CAD 8104	Python Programming Laboratory	**0**	**0**	**4**	**2**
8	CAD 8105	Mini Project	**0**	**0**	**4**	**2**
						23
		SEMESTER 6				
1	CAD 8205	Project				**12**

Total Credits = 124

TECHNOLOGY ELECTIVES

S. No	Course code	Course Name	L	T	P	C
		Mobile Applications				
1	CADY 101	Mobile Commerce	**3**	**0**	**0**	**3**
2	CADY 102	Mobile Security	**3**	**0**	**0**	**3**
3	CADY 103	Mobile and Digital Forensics	**3**	**0**	**0**	**3**
		Cloud Technology				
1	CADY 201	Principles of Virtualization	**3**	**0**	**0**	**3**
2	CADY 202	Cloud Architectures	**3**	**0**	**0**	**3**
3	CADY 203	Cloud Storage Infrastructures	**3**	**0**	**0**	**3**
4	CADY 204	Cloud Security	**3**	**0**	**0**	**3**
		Information Security				
1	CADY 301	Cryptography Fundamentals	**3**	**0**	**0**	**3**
2	CADY 302	Computer Forensics and Investigation	**3**	**0**	**0**	**3**
		IOT and Big data				
1	CADY 401	Data Analytics AND Visualization	**3**	**0**	**0**	**3**
2	CADY 402	Social Media analytics	**3**	**0**	**0**	**3**
3	CADY 403	Health care analytics	**3**	**0**	**0**	**3**
4	CADY 404	R Programming	**3**	**0**	**0**	**3**
5	CADY 405	Decision Support System	**3**	**0**	**0**	**3**
6	CADY 406	Predictive Analysis	**3**	**0**	**0**	**3**

PROGRAMME ELECTIVES

S. No	Course Code	Course Title	L	T	P	C
		SEMESTER II				
1.	CADY 001	Management Information System	**3**	**0**	**0**	**3**
2.	CADY 002	Accounting and Financial Management	**3**	**1**	**0**	**4**
3.	CADY 003	E-commerce	**3**	**0**	**0**	**3**
4.	CADY 004	Business Processes	**3**	**0**	**0**	**3**

S. No	Course Code	Course Title	L	T	P	C
		Semester III				
5.	CADY 021	Grid Computing	**3**	**0**	**0**	**3**
6.	CADY 022	Unix and Network Programming	**3**	**0**	**0**	**3**
7.	CADY 023	Multimedia systems and Algorithms	**3**	**0**	**0**	**3**
8.	CADY 024	Network Security	**3**	**0**	**0**	**3**
9.	CADY 025	Microprocessor and its applications	**3**	**0**	**0**	**3**
10.	CADY 026	TCP/IP Protocol Suite	**3**	**0**	**0**	**3**
11.	CADY 027	Ad Hoc Networks	**3**	**0**	**0**	**3**
		Semester IV				
12.	CADY 041	Digital Image Processing	**3**	**0**	**0**	**3**
13.	CADY 042	Data Mining and Data warehousing	**3**	**0**	**0**	**3**
14.	CADY 043	Software Quality Management	**3**	**0**	**0**	**3**
15.	CADY 044	Embedded Systems	**3**	**0**	**0**	**3**
16.	CADY 045	Business Intelligence	**3**	**0**	**0**	**3**
17.	CADY 046	Software Testing	**3**	**0**	**0**	**3**
18.	CADY 047	Content Management System	**3**	**0**	**0**	**3**
19.	CADY 048	Advanced Programming Techniques	**3**	**0**	**0**	**3**
20.	CADY 049	Information Storage and Management	**3**	**0**	**0**	**3**
21.	CADY 050	Semantic Web	**3**	**0**	**0**	**3**
22.	CADY 051	Enterprise Resource Planning	**3**	**0**	**0**	**3**
23.	CADY 052	Software Project Management	**3**	**0**	**0**	**3**
		SEMESTER V				
24.	CADY 071	Unix Internals	**3**	**0**	**0**	**3**
25.	CADY 072	Advanced Databases	**3**	**0**	**0**	**3**
26.	CADY 073	Software Quality Assurance	**3**	**0**	**0**	**3**
27.	CADY 074	Service Oriented Architecture	**3**	**0**	**0**	**3**
28.	CADY 075	C# and .NET Framework	**3**	**0**	**0**	**3**
29.	CADY 076	PHP Programming	**3**	**0**	**0**	**3**
30.	CADY 077	Online Computer Advertising	**3**	**0**	**0**	**3**
31.	CADY 078	Web Mining	**3**	**0**	**0**	**3**
32.	CADY 079	Digital marketing	**3**	**0**	**0**	**3**
33.	CADY 080	Information Retrieval	**3**	**0**	**0**	**3**
34.	CADY 081	Human Computer Interaction	**3**	**0**	**0**	**3**
35.	CADY 082	Bio-Informatics	**3**	**0**	**0**	**3**

SEMESTER I

MAD 6186 DISCRETE MATHEMATICS

L	T	P	C
3	1	0	4

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 12

Set theory:- Relationships between sets - Operations on sets - Set identities - Principle of inclusion and exclusion - Minsets Relations – Binary relations - Partial orderings - Equivalence relations. Functions:– Properties of functions - Composition of functions – Inverse functions - Permutation functions.

MODULE II LOGIC 12

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 12

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

MODULE IV ALGEBRAIC STRUCTURES 12

Introduction- Properties of an algebraic systems –Morphisms – Semigroups – Monoids – Sub semigroups and Submonoids –Groups-Order of a group – order of an element-permutation groups-subgroups –cyclic groups.

MODULE V MORPHISMS ON ALGEBRAIC STRUCTURES 12

Morphisms of groups – kernal of homomorphism - Cosets and Lagrange's theorem – Normal subgroups – Rings and Fields.

Total Hours: 60

TEXT BOOKS AND REFERENCES:

1. Judith L. Gersting, "Mathematical Structures for Computer Science", 5th Edition, W.H. Freeman and Company, New York, 2003.
2. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mcgraw Hill, 1997.
3. Rosen K.H., "Discrete Mathematics and its Applications", Tata McGraw-Hill Publishing Company Limited, New Delhi, 5th Edition, 2003.
4. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", Pearson/Addison Wesley, 2007.
5. Michael Sipser, "Introduction to Theory of Computation", 3rd edition, Cengage Learning, 2012.

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

CAD 6101 PROGRAMMING IN C AND C++

L	T	P	C
3	1	0	4

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 12

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input / Output Operations – Formatted I/O – Decision Making - Branching –- IF, Nested IF – Switch – goto - Looping- While, do, for statements.

MODULE II ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS 12

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 12

Pointers – Declaration, Accessing a variable, character strings, pointers to functions and structures - File Management in C – Dynamic Memory allocation.

MODULE IV OBJECT ORIENTED CONCEPTS 12

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 12

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
2. E.Balagurusamy, “Programming in ANSI C”, Tata McGraw Hill, 2004.
3. Robert Lafore, “Waite Groups OOP in Turbo C++”, Galgotia Publications,2001.
4. Stanley, B.Lippman,JoveLagrie, “C++Primer”,3rd Edition, AddisonWesley,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.

CAD 6102 COMPUTER ORGANIZATION

L	T	P	C
3	0	0	3

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

Logic functions – synthesis of logic functions – Minimizations of logic - Synthesis with NAND and NOR gates - Implementation of Logic gates - Flip-flops – Registers and shift registers – counters – decoders – Multiplexers – PLDs – sequential circuits. Basic Structure of Computers: Functional Units - Basic operational concepts – Bus structures – performance – Multi processors and Multi computers: Functional Units – Basic operational concepts – Bus structures – performance – Multiprocessors and Multi computers – Historical Perspective.

MODULE II MACHINE INSTRUCTIONS AND PROGRAMS 09

Numbers, Arithmetic operations and characters – Memory locations and address, operations – instructions and instruction, sequencing – addressing modes - assembly language – basic input/output operations – subroutines – encoding of Machine instructions. Instructions – Assembly language –O/I operations – Registers and addressing – Instructions language – program flow control – I/O operations - logic instructions of 6300 and Intel Pentium.

MODULE III INPUT / OUTPUT ORGANIZATION 09

Accessing I/O Devices – Interrupts – direct memory access – buses 240-interface circuits – Standard I/O Interfaces.

MODULE IV MEMORY SYSTEM 09

Concepts – semiconductor RAM memories – Read only memories – Cache memories – performance considerations – virtual memories management requirements – secondary storage Arithmetic: Addition and subtraction of signal members – design of fast adders – multiplication of positive members – signed

operand multiplication – fast multiplication – integer division – floating point numbers and operations.

MODULE V BASIC PROCESSING UNIT 09

Concepts – execution of a complete instruction – Multiple – Bus organization – hardware control – micro programmed control. Pipelining: Concepts – Data hazards – instruction hazards – influence on Instruction sets - data path and control constructions – supers cal operation- ultra SPARC II – Performance considerations.

Total Hours: 45

TEXT BOOKS:

1. Hamacher C, Vranesic Z, and Zaky S. Computer Organization, 5th edition, McGraw – Hill, 2002.

REFERENCE BOOKS:

1. Stallings W, Computer Organization and Architecture, 6th edition. Parson Education, 2003.
2. Mano M.M. Computer System Architecture, 3rd edition. PHI, 1993.
3. Yarbrough JM, Digital Logic – Applications and Design, Thomas Lernig, 1997.
4. Heuring VP, and Jordan HF, Computer Systems Design and Architecture, Pearson

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

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

MODULE II RELATIONAL DATABASES 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

Storage & File Structure - Disks-RAID-File Organization - Indexing &Hashing- B+ TREE-B Tree-Static Hashing-Dynamic Hashing-Multiple Key Access.

MODULE IV QUERY EVALUATION & OPTIMIZATION 09

Query Processing-Selection Operation-Sorting-Join Operation-Evaluation of Expressions-Query Optimization.

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:

1. Abraham Silberschatz, Hentry F.Korth and S.Sudharssan, “Database System Concepts”, 4th Edition, Tata McGraw Hill, 2002.

REFERENCES:

1. Raghu Ramakrishnan & Johannes Gerhrke, “Data Base Management Systems”, McGraw Hill International Edition, 2000.

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

CAD 6104 **COMPUTER NETWORKS**

L	T	P	C
3	0	0	3

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 09

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

MODULE II NETWORK FUNDAMENTALS 09

LAN Technology – LAN Architecture – BUS/Tree – Ring – Star – Ethernet – Token Rings – Wireless.

MODULE III NETWORK LAYER 09

Packet Switching – Switching and Forwarding – Bridges and LAN switches – Internetworking – Simple Internetworking – Routing.

MODULE IV TRANSPORT LAYER 09

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

MODULE V PRESENTATION LAYER and APPLICATIONS 09

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:

1. Larry L. Peterson & Bruce S. Davie, “Computer Networks - A systems Approach”, 2nd Edition, Harcourt Asia/ Morgan Kaufmann, 2000.

REFERENCES:

1. James F. Kurose and Keith W. Ross, “Computer Networking - A Top Down Approach featuring the Internet”, 1st Edition, Addison Wesley Publishing Company, 2001.
2. William Stallings, “Data and Computer Communications”, 5th Edition, PHI, 1997.
3. Andrew S. Tanenbaum, “Computer Networks”, Tata Mcgraw Hill, 3rd Edition, 2001.

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.

CAD6105 C AND C++ PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

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.
16. Program using virtual 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

CAD 6106 **DBMS LABORATORY**

L	T	P	C
0	0	4	2

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 SYSTEMS	L	T	P	C
		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 09

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

MODULE II 2D TRANSFORMATIONS 09

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

MODULE III 3D TRANSFORMATIONS 09

3D Concepts - Projections – Parallel Projection - Perspective Projection – Visible Surface Detection Methods - Visualization and polygon rendering – Color models \– XYZ-RGB-YIQ-CMY-HSV Models - animation – Key Frame systems - General animation functions - morphing.

MODULE IV OVERVIEW OF MULTIMEDIA 09

Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring.

MODULE V MULTIMEDIA SYSTEMS AND APPLICATIONS 09

Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand.

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.
9. Develop a presentation for a product using techniques like Guide Layer, masking and onion Skin using 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:

1. Hearn D and Baker M.P, “Computer graphics – C Version”, 2nd Edition, Pearson Education, 2004 (unit 1, 2 &3)
2. Ralf Steinmetz, Klarasteinmetz, “Multimedia Computing, Communications and Applications”, Pearson education, 2004 (unit 4 & 5)

REFERENCES:

1. Siamon J. Gibbs and Dionysios C. Tsichritzis, “Multimedia programming”, Addison Wesley, 1995.
2. John Villamil, Casanova and LeonyFernanadez, Eliar, “Multimedia Graphics”, PHI, 1998.

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

CAD6202 PROBABILITY AND STATISTICS

L	T	P	C
3	1	0	4

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

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of least squares – Regression Lines.

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:

1. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences”, Thomson and Duxbury, 2002.
2. Richard Johnson. “Miller & Freund’s Probability and Statistics for Engineer”, Prentice – Hall, Seventh Edition, 2007.
3. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, Pearson Education, Asia, Fifth Edition, 2002.
4. Gupta S.C. and Kapoor V.K. “Fundamentals of Mathematical Statistics”, Sultan and Sons, 2001.
5. Dallas E Johnson, “Applied Multivariate Methods for Data Analysis”, Thomson and Duxbury press, 1998.

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

CAD6203 ALGORITHM ANALYSIS AND DATA STRUCTURES

L	T	P	C
3	1	0	4

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 IITREE 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

Hashing – Separate chaining –open addressing–rehashing –extendible hashing – Disjoint Set ADT–dynamic equivalence problem–smart union algorithms– path compression–applications of Sets

MODULE IV GRAPHS AND THEIR APPLICATIONS 12

Definitions – Topological sort–breadth-first traversal- shortest-path algorithms–minimum spanning tree– Prim's and Kruskal's algorithms–Depth-first traversal–biconnectivity–Euler circuits–applications of graphs.

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

TEXT BOOK:

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

REFERENCES:

1. Robert Kruse & Clovis L. Tondo “Data Structures and Program Design in C”, Prentice Hall, 2nd edition, 1991.
2. Weiss “Data Structures and Algorithm Analysis in C”, Addison Wesley, 2nd Edition, 1997.
3. R.F.Gilberg, B.A.Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005.
4. K.S.Easwara kumar, Object Oriented Data Structures using C++, Vikas
5. Publishing House pvt.Ltd., 2000.
6. Sara Baase and A.VanGelder, “Computer Algorithms”, Third Edition, Pearson Education, 2000.
7. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition, Prentice Hall of India Ltd, 2001.

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.

CAD 6204 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

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 07

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 08

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 10

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 10

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-Segmentation-Page Replacement Methods-Locality-Working Sets.

MODULE V I/O AND FILE SYSTEMS 10

Disk Scheduling-File Concepts-File System Structure-Access Methods- Directory Structure-Protection-Directory Implementation-Allocation Methods-Free Space Management-Case Study: Linux System.

Total Hours: 45

TEXT BOOK:

1. Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2004.

REFERENCES:

1. Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 1992.
2. P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall of India, 2004.
3. H.M.Deitel, An Introduction to Operating Systems, 2nd Edition, Pearson Education, 2002.

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.

CAD 6205	ALGORITHM ANALYSIS AND DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

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.
3. Solve the knapsack problem using greedy method.
4. Construct a minimum spanning tree using greedy method.
5. Construct optimal binary search trees using dynamic programming method of problem solving.
6. Find the solution for traveling salesperson problem using dynamic programming approach.
7. Perform graph traversals.
8. Implement the 8 Queens Problem using backtracking.
9. Implement knapsack 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.

CAD6206 OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

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:

1. Basics of UNIX commands.
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.
4. Identify use and evaluate the storage management policies with respect to different storage management technologies.
5. Identify the need to create the special purpose operating system.

CAD6207 COMMUNICATION SKILLS LABORATORY

L	T	P	C
0	0	2	1

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 :

1. A.J.Thomson & A.V. Martinet, “A Practical English Grammar” Oxford University Press, 1999.
2. Andrea J. Rutherford, “Basic Communication Skills for Technology”, second edition, Pearson Education, 2007.

3. P.K.Dutt, G. Rajeevan and C.L.N. Prakash, “A Course in Communication Skills”, Cambridge University Press, India 2007.
4. Krishna Mohan and Meera Banerjee, “Developing Communication Skills”, Macmillan India Ltd. (reprinted 1994-2007).
5. Riordan, Pauley, “Report Writing Today”, AIT B.S. Publisher, New Delhi (2000).
6. Gerson, Sharon, Steve m. Gerson, “Technical Writing: Process and Product”, Pearson Education, New Delhi (2004).
7. R.K. Bansal, J.P. Harrison, “Spoken English”, Orient Longman, Mumbai (1999)
8. Grant Taylor, “English Conversation Practice” Tata MC Graw Hill, New Delhi (1997).

OUTCOMES:

On completion of this course, students will be able to

- 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 SPECIFIYING 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 CONFIGURATIONMANAGEMENT 10

Overview of mapping- Mapping models to Code- Mapping Object Model to Database Schema- Overview of testing- Testing concepts- Testing activities-Managing testing.

Managing and controlling Changes- Managing and controlling versions- Types of maintenance- Maintenance log and defect reports- Reverse and re-engineering.

Total Hours: 45

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.
9. Expert system for medical purpose.
10. Platform assignment system for the trains in a railway station
11. E-mail Client system.

Total Hours: 30

TEXT BOOKS:

1. Stephan R. Schach, "Object oriented and classical software engineering", 8th Edition, Tata McGraw Hill, 2010.
2. Bernd Bruegge, "Object oriented software engineering", 3rd Edition, Pearson Education, 2009.

REFERENCES:

1. Timothy C. Lethbridge, Robert Laganiere, "Object-Oriented Software Engineering - A practical software development using UML and Java", 3rd Edition, Tata McGraw-Hill, 2006.
2. S.K.Kataria, Rajiv Chopra, "Object Oriented Software Engineering", 3rd Edition, 2013.

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.

CAD 7102 INTERNET AND JAVA PROGRAMMING

L	T	P	C
3	0	0	3

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

Overview – Web Security, Privacy, and site-blocking – Audio and Video on the web – Creating and Maintaining the Web – Web site creation concepts – Web Page Editors – Optimizing Web Graphics – Web Audio Files – Forms, Interactivity, and Database-Driven Web sites – File Transfer and downloading– FTP – Peer to Peer – Downloading and Installing software.

MODULE III JAVA FUNDAMENTALS 08

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Packages and Interfaces –Exception handling.

MODULE IV PACKAGES 12

AWT package – Layouts – Containers – Event Package – Event Model – Painting– Garbage Collection - Multithreading – Language Packages.

MODULE V ADVANCED JAVA PROGRAMMING 09

Utility Packages – Input Output Packages – Inner Classes – Java Database Connectivity - Servlets - RMI – Java Beans.

Total Hours: 45

TEXT BOOKS:

1. Margaret Levine Young, “Internet and WWW”, 2nd Edition, Tata McGraw Hill, 2002. (Unit 1 & 2)
2. Herbert Schildt, The Complete Reference – Java 2 , 4th Edition, Tata McGraw Hill, 2001. (Unit 3, 4 & 5)

REFERENCES:

1. Keyur shah, “Gateway to Java Programmer Sun Certification”, Tata McGraw Hill 2002.
2. Deitel & Deitel, Java How to Program, Prentice Hall 1999.

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

MAD 6187 RESOURCE MANAGEMENT TECHNIQUES

L	T	P	C
3	1	0	4

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

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem.

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

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

MODULE V QUEUING MODELS 12

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

L: 45, T : 15 Total Hours: 60

TEXT BOOK:

1. Taha H.A., "Operations Research: An Introduction" 7th Edition, Pearson Education, 2004.

REFERENCES:

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, “Operations Research”, Pearson Education, Asia, 2005.
2. Prem Kumar Gupta, D.S. Hira, “Operations Research”, S.Chand & Company Ltd, New Delhi, 3rd Edition, 2003.

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

CAD 7103 CLOUD COMPUTING

L	T	P	C
3	0	0	3

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

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.

MODULE II DEVELOPING CLOUD SERVICES 09

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service– Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.

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

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

MODULE V OTHER WAYS TO COLLABORATE ONLINE 09

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

Total Hours: 45

REFERENCES:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kumar Saurabh, “Cloud Computing – Insights into New Era Infrastructure”, Wiley Indian Edition, 2011.
3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On- demand Computing, Applications and Data Centres in the Cloud with SLAs, Emereo Pty Limited, July 2008.

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.

CAD 7104 MOBILE APPLICATION DEVELOPMENT

L	T	P	C
3	0	0	3

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 08

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 09

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 09

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 10

Views &View Groups, Views : Button, Text Field, Radio Button, Toggle Button, Checkbox, Spinner, Image View, Image switcher, Event Handling, Listeners, Layouts : Linear, Relative- List View- Grid View-Table View- Web View- Adapters-Menus,

Action Bars, Notifications : Status, Toasts and Dialogs, Styles and Themes, Creating Custom Widgets, Focus, Touch Mode, Screen Orientation. Designing for Tablets – Working with tablets: Developing for the Honeycomb and Ice Cream Sandwich platforms, Manipulating objects with drag and drop-Localization, Localization Strategies, Testing Localized Applications, Publishing Localized Applications-Data Access and Storage- SQLite Databases.

MODULE V NATIVE CAPABILITIES AND TESTING 09

Android Media API: Playing audio/video, Media recording. Sensors - how sensorswork, listening to sensor readings. Bluetooth. Maps & Location: Android Communications: GPS, Working with Location Manager, Working with Google Maps extensions, Maps via intent and Map Activity, Location based Services. Location Updates, location-based services (LBS), Location Providers- Testing and Commercializing Applications - Basics of Testing- Debugging using DDMS-getting your app on the app store

Total Hours: 45

TEXT BOOKS:

1. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012.
2. Android in Action, Third Edition, by W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, 2012.

REFERENCES:

1. Android Application Development Cookbook, by Wei-Meng Lee, John Wiley and Sons, 2013.
2. Beginning Android 4, by Grant Allen, Apress, 2011.

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 iPone 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

Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed. Statistical Inference - Populations and samples - Statistical modelling, probability distributions, fitting a model.

MODULE II EXPLORATORY DATA ANALYSIS 9

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

MODULE III MATHEMATICAL TOOLS 9

Mathematical Tools for Data Science - Statistics Inferences and Probability - Linear Algebra.

MODULE IV MACHINE LEARNING 9

Machine Learning in Data Science Supervised, unsupervised, reinforcement and deep learning, 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:

- Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
- Additional references and books related to the course:
- Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
- Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
- Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
- Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)

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

CAD 7106	ADVANCED TECHNOLOGY LABORATORY (Cloud/Mobile/Data Science)	L	T	P	C
		0	0	4	2

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

Total Hours: 60

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.

CAD 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.

SEMESTER IV

CAD 7201 ADVANCED WEB DESIGN AND DEVELOPMENT

L	T	P	C
3	0	0	3

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

Introduction to Network, Internet and Intranet, Application and Services, Internet Addressing – IP, DNS, URL. Elements of Web – Web Page, Web Site, Web Client & Server. Web Languages – HTML/DHTML, JavaScript, PHP, XML.

MODULE II BUILDING WEB BASED APPLICATION USING HTML 09

Html Document Structure, Various HTML Tags – Document Tag, Text Formatting Tag, Link Tag, List Tag, Image Tag, Table Tag, Line Breaks, Frame, Frameset, HTML Forms.

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 09

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:

1. Beginning PHP5, Apache, Mysql Web Development, Wrox, Elizabeth Naramore, Michael K. Glass, 2005.
2. PHP Bible, Wiley Publication, Tim Converse, Joyce Park, 2002.
3. Web Enabled Commercial Application Development Using HTML, DHTML, PERL, Java Script, BPB Publications, Ivan Bayross, 2005.
4. Beginning Ajax, Wrox, Chris Ullman, Lucinda Dykes, 2007.
5. Beginning JavaScript 2nd Edition, Wrox, Nicholas C. Zakas, 2004.

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.

CAD 7202 XML AND WEB SERVICES

L	T	P	C
3	0	0	3

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 09

Role of XML – XML and The Web – XML Language Basics – SOAP – Web Services – Revolutions Of XML – Service Oriented Architecture (SOA).

MODULEII XML TECHNOLOGY 09

XML – Name Spaces – Structuring with Schemas and DTD – Presentation Techniques – Transformation – XML Infrastructure.

MODULE III SOAP 09

Overview of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure– Intermediaries – Actors – Design Patterns and Faults – SOAP with Attachments.

MODULE IV WEB SERVICES 09

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

MODULE V XML SECURITY 09

Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Digital Signature – XKMS Structure – Guidelines for Signing XML Documents – XML in Practice.

Total Hours: 45

TEXT BOOK:

1. Frank. P. Coyle, XML, Web Services and The Data Revolution, Pearson Education, 2002.

REFERENCES:

1. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, “Developing Java Web Services”, Wiley Publishing Inc., 2004.
2. Sandeep Chatterjee, James Webber, “Developing Enterprise Web services”, Pearson Education, 2004.
3. McGovern, et al., “Java Web Services Architecture”, Morgan Kaufmann Publishers, 2005.

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.

CAD 7203 MACHINE LEARNING TECHNIQUES

L	T	P	C
3	1	0	4

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**

Introduction- overview of machine learning- Different forms of learning- Generative learning- Gaussian parameter estimation- maximum likelihood estimation- MAP estimation- Bayesian estimation- bias and variance of estimators- missing and noisy features- nonparametric density estimation- applications- software tools.

MODULE II **12**

Classification Methods-Nearest neighbour- Decision trees- Linear Discriminant Analysis - Logistic regression-Perceptrons- large margin classification- Kernel methods- Support Vector Machines. Classification and Regression Trees.

MODULE III **12**

Graphical and sequential models- Bayesian networks- conditional independence Markov random fields- inference in graphical models- Belief propagation- Markov models- Hidden Markov models- decoding states from observations- learning HMM parameters.

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 **12**

Neural networks- the perceptron algorithm- multilayer perceptron's- back propagation nonlinear regression- multiclass discrimination- training procedures- localized network structure- dimensionality reduction interpretation.

Total Hrs. : 60

TEXT BOOK AND REFERENCES:

1. T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer, 2009.
2. E. Alpaydin, "Machine Learning", MIT Press, 2010.
3. K. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
4. C. Bishop, "Pattern Recognition and Machine Learning, Springer", 2006.
5. ShaiShalev-Shwartz, Shai Ben-David, "Understanding Machine Learning: From
6. Theory to Algorithms", Cambridge University Press, 2014.
7. John Mueller and Luca Massaron, "Machine Learning For Dummies", John

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	L	T	P	C
		0	0	4	2

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. Java script 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

Total Hours: 60

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

CAD7205 **XML AND WEB SERVICES LAB** **L T P C**
0 0 4 2

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.
3. Create an XML schema for the book's XML document from exercise.
4. Create an XML document to store resumes for a job web site and create the DTD file.
5. Present the book's XML document using cascading style sheets (CSS).
6. Write an XSLT program to extract book titles, authors, publications, book rating from the book's XML document and use formatting.
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.

Total Hours: 60

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.

CAD7206	SOFT SKILLS AND PERSONALITY DEVELOPMENT	L	T	P	C
		0	0	2	1

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

Awareness of Real World Industry and Situations - Conscious Self-Awareness - Practical Visualizations - Neuro- Linguistic Programming Basics - Developing Self Esteem and Self-Motivation - Confident Goal Setting - Positive Attitude Development and Positive Thinking - Developing Inner Achievement Mindset.

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

Fluency with increased vocabulary - Group Discussion Etiquette - Advanced Group Discussions - Giving a positive Body Language - Interviews: Clear Speaking - Interviews: Handling Pressure.

Total Hours: 30

REFERENCES :

1. Charles Faulkner and Steve Andreas, "NLP: The New Technology of Achievement", Harper Paperbacks publishers, 1996.

2. SarveshGulati, "Corporate Soft Skills", Rupa and Co publishers.
3. P.K.Dutt, G.Rajeevan and C.L.N. Prakash, “A Course in Communication
4. Skills”, Cambridge University Press, India 2007.

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

L	T	P	C
3	0	0	3

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 06

Python Overview- Environment Setup- Basic Syntax- Python Identifiers-Reserved Words- Lines and Indentation- Comments- Variable Types- BasicOperators-Decision Making-Loops.

MODULE II BUILT IN FUNCTIONS 09

Python - Numbers – Math Functions-Strings - Special Operators- Formatting Operator- Built-in String Methods- Lists –List operations and Functions- Tuples – Basic Tuple operations and Functions -Dictionary –Adding-updating-Deleting-Built in Functions and Methods.

MODULE III DATE AND TIME FUNCTIONS 10

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 10

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

1. Vernon L. Ceder ," The Quick Python Book “, 2nd Edition, Manning Publications, Jan 2010.
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.

CAD 8102 INTERNET OF THINGS

L	T	P	C
3	0	2	4

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

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoTvs M2M - IoT systems management.

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

Building IoT With Raspberry Pi - Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services - Building IoT with Galileo/ Arduino - Intel Galileo Gen2 with Arduino - Interfaces - Arduino IDE – Programming - APIs and Hacks.

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:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things by Pearson Paperback – 16 Aug 2017.
3. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
4. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

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

CAD 8103 BIG DATA AND ITS ANALYTICS

L	T	P	C
3	0	0	3

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 09

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 09

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 09

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 08

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 10

Real-Time Architecture – Orchestration and Synthesis Using Analytics Engines

– Discovery using Data at Rest – Implementation of Big Data Analytics – Big Data Convergence – Analytics Business Maturity Model- Installing and Running Pig – Comparison with Databases – Pig Latin – User- Define Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables.

Total Hours: 45

TEXT BOOK AND REFERENCES:

1. Michael Minelli, Michehe Chambers, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business”, 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, “Big Data Analytics: Disruptive Technologies for Changing the Game”, 1st Edition, IBM Corporation, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, 1st Edition, Wiley and SAS Business Series, 2012.
4. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.

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

CAD 8106 SOCIAL ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

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

Customers and Markets, Identification of Customer Segment, Niche Segment, Customers Jobs, Pain and Gain, Early Adopters, Value Proposition Canvas, Basics of Business Model and Lean Canvas, Risk and Assumptions.

MODULE III VALIDATION AND MONEY 9

Blue Ocean Strategy, Solution Demo, Problem – Solution Fit, Minimum Viable Product- Product Market Fit, Prototype – Case Study. Cost, Revenues, Pricing, Profitability Checks, Bootstrapping, Initial Financing and Pitching.

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 SOCIETIES AND CASES 9

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

1. Entrepreneurship Rajeev Roy oxford, 2012.
2. Learn wise platform - Wadhwani Foundation, 2018
3. “Social Entrepreneurship and Social Business” Christine K Volkmann, Springer Gabler 2012.
4. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016.

REFERENCES

1. Social Entrepreneurship” Manuel London, Routlege, 2012.
2. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016.
3. “Anatomy of Business Plan” – Linda Pinson, OMIM publication, Seventh Edition, 2008.
4. Running Lean: Iterate From Plan A To a Plan That Works, Ash Maurya, "O'Reilly Media, Inc.", 28-Feb-2012.

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.

CAD 8104 PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

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.

CAD 8105	MINI PROJECT	L	T	P	C
		0	0	4	2

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 VOCE

Confidence level, Programming knowledge, Professional approachand 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.

CAD 8206 **PROJECT** **L T P C**
12

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 - Iimpact 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

TCP/IP Model –Wireless Internet protocol and Wireless Application Protocol – Architecture-M-Commerce technical Issues –M-Commerce Business Issues-M-Commerce services-Mobility and M-commerce – Mobility and Location Information – Mobility and customer care-Billing Cost – Operational Support System –OSS-Revenue assurance and Fraud-Internet Business Model.

MODULE IV M-COMMERCE IN BUSINESS MODELS 09

ERP and Customer Relationship Management **-** e-business model –XML, EDI and E-Business Integration– E-market technology solutions-E-procurement – E-Business networks and Supply chains-Middleware-Remote procedure calls-Remote method invocation-Message oriented middleware and Transaction oriented middleware.

MODULE V CONVERGENCE OF TECHNOLOGIES IN B2B - CASE STUDY 09

Enterprise Application Integration – Web services Transactions- Rosetta net - Electronic Business XML- Convergence of Rosetta net , ebXML and web services technologies-Case Study.

Total Hours 45

REFERENCE BOOKS

1. Dave Chaffey, “E-Business and E-Commerce management “, Fourth Edition Pearson Education.2009
2. P.J Louis, “M-Commerce Crash course “, McGraw Hill Companies – 2001
3. Michael P papa Zoglou, Peter MA Ribbers, “e- Business Organizational and Technical foundation ‘Wiley India, 2009
4. Dr Pandey, Saurabh Shukla, “E-Commerce and Mobile Commerce technologies, Sultan Chand Publication ,2011

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.

CADY 102 MOBILE SECURITY L T P C

3 0 0 3

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 05

Security and Privacy for Mobile and Wireless Networks: Introduction- State of the Art- Areas for Future Research- General Recommendation for Research. Pervasive Systems: Enhancing Trust Negotiation with Privacy Support: Trust Negotiation- Weakness of Trust Negotiation- Extending Trust Negotiation to Support Privacy

MODULE II MOBILE SECURITY 10

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 10

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 09

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management in Ad hoc Wireless Networks, Secure Routing in Ad hoc Wireless Networks

MODULE V RFID SECURITY 11

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

RFID Systems, Scalability Issues in Large-Scale Applications, An Efficient and Secure RFID Security Method with Ownership Transfer, Policy-based Dynamic Privacy Protection Framework leveraging Globally Mobile RFIDs, User-Centric Security for RFID based Distributed Systems, Optimizing RFID protocols for Low Information Leakage, RFID: an anti-counterfeiting tool.

Total Hours: 45

REFERENCES

1. Kia Makki, Peter Reiher, “Mobile and Wireless Network Security and Privacy “, Springer, ISBN 978-0-387-71057-0, 2007.
2. C. Siva Ram Murthy, B.S. Manoj, “Ad hoc Wireless Networks Architectures and Protocols”, Prentice Hall, x ISBN 9788131706885, 2007.
3. Noureddine Boudriga, ”Security of Mobile Communications”, ISBN 9780849379413, 2010.
4. Kitsos, Paris; Zhang, Yan , “RFID Security Techniques, Protocols and System-On-Chip Design “, ISBN 978-0-387-76481-8, 2008.
5. Johnny Cache, Joshua Wright and Vincent Liu,” Hacking Wireless Exposed: Wireless Security Secrets & Solutions “, second edition, McGraw Hill, ISBN: 978-0-07-166662-6, 2010.

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.

CADY 103 MOBILE AND DIGITAL FORENSICS L T P C
3 0 0 3

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 09

Overview of wireless technologies and security: Personal Area Networks, Wireless Local Area Networks, Metropolitan Area Networks, Wide Area Networks. Wireless threats, vulnerabilities and security: Wireless LANs, War Driving, War Chalking, War Flying, Common Wi-fi security recommendations, PDA Security, Cell Phones and Security, Wireless DoS attacks, GPS Jamming, Identity theft.

MODULE II SECURITY FRAMEWORK FOR MOBILE SYSTEMS 09

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 12

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 07

Digital forensics: Introduction – Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential- Device handling: seizure issues, device identification, networked devices and contamination.

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

1. Gregory Kipper, “Wireless Crime and Forensic Investigation”, Auerbach Publications, 2007.
2. Iosif I. Androulidakis, “ Mobile phone security and forensics: A practical approach”, Springer publications, 2012.
3. Andrew Hoog, “ Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Elsevier publications, 2011.
4. Angus M.Marshall, “ Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.

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

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization-Virtualization Advantages – Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines – System Virtual Machines – Hypervisor - Key Concepts.

MODULE II SERVER CONSOLIDATION 09

Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development – Selecting server Virtualization Platform.

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

SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model.

MODULE V VIRTUAL MACHINES PRODUCTS 09

Xen Virtual machine monitors- Xen API – VMware – VMware products – Vmware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server.

Total Hours: 45

TEXT BOOK AND REFERENCES:

1. William von Hagen, Professional Xen Virtualization, Wrox Publications, January, 2008.
2. Chris Wolf , Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress 2005.
3. Kumar Reddy, Victor Moreno, Network virtualization, Cisco Press, July, 2006.
4. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
5. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications, 2006.

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.

CADY 202 CLOUD ARCHITECTURES L T P C

3 0 0 3

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

1. Gautam Shroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach” McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.
3. Dimitris N. Chorafas, “Cloud Computing Strategies” CRC Press; 1 edition [ISBN: 1439834539],2010.

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.

CADY 203 CLOUD STORAGE INFRASTRUCTURES L T P C
3 0 0 3

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.

Total Hours: 45

TEXT BOOKS AND REFERENCES

1. Greg Schulz, “Cloud and Virtual Data Storage Networking”, Auerbach Publications [ISBN: 978-1439851739], 2011.
2. Marty Poniatowski, “Foundations of Green IT” Prentice Hall; 1 edition [ISBN: 978-0137043750], 2009.
3. EMC, “Information Storage and Management” Wiley; 2 edition [ISBN: 978-0470294215],2012.
4. Volker Herminghaus, Albrecht Scriba, “Storage Management in Data Centers” Springer; edition [ISBN: 978-3540850229]. 2009.
5. Klaus Schmidt, “High Availability and Disaster Recovery” Springer; edition [ISBN: 978-3540244608], 2006.

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.

CADY 204 CLOUD SECURITY L T P C
3 0 0 3

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 10

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 09

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` 07

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 09

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 10

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

1. Tim Mather, Subra Kumaraswamy, Shahed Latif, “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance” O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.
2. Ronald L. Krutz, Russell Dean Vines, “Cloud Security” [ISBN: 0470589876], 2010.
3. John Ritting house, James Ransome, “Cloud Computing” CRC Press; 1 edition [ISBN: 1439806802], 2009.
4. J.R. ("Vic") Winkler, “Securing the Cloud” Syngress [ISBN: 1597495921] 2011.
5. Cloud Security Alliance, “Security Guidance for Critical Areas of Focus in Cloud Computing” 2009.
6. VMware “VMware Security Hardening Guide” White Paper, June 2011.
7. Cloud Security Alliance 2010, “Top Threats to Cloud Computing” Microsoft 2013.
8. Timothy Grance; Wayne Jansen;NIST “Guidelines on Security and Privacy in Public Cloud Computing”, 2011.
9. Evelyn Brown NIST “Guide to Security for Full Virtualization Technologies”, 2011.

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

CADY 301 CRYPTOGRAPHY FUNDAMENTALS L T P C
3 0 0 3

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

Computer and Network Security concepts – The OSI Security Architecture – Security attacks – Security Services – Security Mechanisms – Fundamental Security Design Principles – Attack surfaces and Attack Trees – Introduction to Number Theory – Divisibility and the Division Algorithm – The Euclidean Algorithm – Modular Arithmetic Prime Numbers – Fermat's and Euler's Theorem – The Chinese Remainder Theorem.

MODULE II SYMMETRIC CIPHERS 09

Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography – Block Ciphers and Data Encryption Standard – Traditional Block Cipher Structure – The Data Encryption Standard – DES Example – Strength of DES – Block Cipher Design Principles - Advanced Encryption Standard – Block Cipher Operation – Multiple Encryption and Triple DES – Electronic Code book – Cipher Block Chaining Mode.

MODULE III ASYMMETRIC CIPHERS 09

Public- Key Cryptography and RSA – Principles of Public Key Cryptosystem – RSA Algorithm – Diffie-Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudo Random Generation.

MODULE IV CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS 09

Cryptographic Hash Functions – Applications of Cryptographic Hash functions – Simple Hash Functions – Requirements and Security – Hash Functions Based on Cipher Block Chaining – Secure Hash Algorithm (SHA) – Message Authentication Codes – Digital Signatures.

MODULE V MUTUAL TRUST 09

Key Management and distribution – Symmetric Key Distribution using Symmetric Distribution – Public Key infrastructure – User authentication – Remote User Authentication Principle – Kerberos – Remote User Authentication using symmetric and Asymmetric Encryption.

TOTAL HOURS 45

TEXT BOOKS AND REFERENCES:

1. Williams Stallings, “Cryptography and Network Security: Principles and Practice”, Pearson Education, 7th Edition, ISBN: 10:1-292-15858-1, 2017.
2. Manuel Mogollon, “Cryptography and Security Services: Mechanisms and Applications “, Cybertech Publishing, 1st Edition, ISBN-13: 978-1599048376, 2008.
3. Mike Speciner, Radia Perlman, “Network Security: Private Communications in a Public World”, Pearson Education, 2nd Edition, ISBN: 0-13-046019-2, 2002.
4. Christof Paar; Bart Preneel; Jan Pelzl,”, Understanding Cryptography: a Textbook for Students and Practitioners”, Springer, e-ISBN: 978-3-642-04101-3, 2014.

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.

CADY 302 COMPUTER FORENSICS AND INVESTIGATION L T P C
3 0 0 3

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

Network Forensic: Collecting and analyzing network-based evidence, reconstructing web browsing, e-mail activity, and windows registry changes, intrusion detection, tracking offenders, etc. Mobile Network Forensic: Introduction, Mobile Network Technology, Investigations, Collecting Evidence, where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.

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:

1. Digital Forensics with Open Source Tools. Cory Altheide and Harlan Carvey, ISBN: 978-1-59749-586-8, Elsevier publication, April 2011.
2. Computer Forensics and Cyber Crime: An Introduction (3rd Edition) by Marjie T. Britz, 2013.

REFERENCE BOOKS:

- Network Forensics: Tracking Hackers Through Cyberspace, Sherri Davidoff, Jonathan Ham, Prentice Hall, 2012
- Guide to Computer Forensics and Investigations (4th edition). By B. Nelson, A. Phillips, F. Enfinger, C. Steuart. ISBN 0-619-21706-5, Thomson, 2009.
- 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
- File System Forensic Analysis. By Brian Carrier. Addison-Wesley Professional, March 27, 2005.
- 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)
- Digital Evidence and Computer Crime, Third Edition: Forensic Science, Computers, and the Internet by Eoghan Casey, 2011

- The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory. Michael Hale Ligh, Andrew Case, Jamie Levy, AAron Walters, ISBN: 978-1-118-82509-9, July 2014

Other Resources:

Computer Forensic Training Center Online http://www.cftco.com/

1. Computer Forensics World http://www.computerforensicsworld.com/
2. Computer Forensic Services http://www.computer-forensic.com/
3. Digital Forensic Magazine http://www.digitalforensicsmagazine.com/
4. The Journal of Digital Forensics, Security and Law http://www.jdfsl.org/
5. Journal of Digital Forensic Practice http://www.tandf.co.uk/15567281
6. DOJ Computer Crime and Intellectual Property Section-http://www.usdoj. gov/ criminal/cybercrime/searching.html.
7. Electronic Crime Scene Investigation: A Guide for First Responders-http:// www.ojp.usdoj.gov/ nij/ pubs-sum/187736.htm and related publications at http://nij.ncjrs.org/publications/pubs_db.asp
8. CERIAS Forensics Research (http://www.cerias.purdue edu/ research/forensics)
9. Scientific Working Group on Digital Evidence (http:// ncfs. org/ swgde / index. html)
10. DoD Cyber Crime Center (http://www.dc3.mil)
11. National Criminal Justice Reference Service http:// www.ncjrs.gov/ app/ publications/ alphalist.aspx.

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.

CADY 401 DATA ANALYTICS AND VISUALISATION L T P C
3 0 0 3

OBJECTIVES:

- Develop skills to both design and critique visualizations
- 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 09

Introduction - Terminology - Basic Charts and Plots, - Multivariate Data Visualization - Principles of Perception-Color, Design, and Evaluation.

MODULE II DATA VISUALISATION-I 09

Text Data Visualization - Interactivity and Animation - Temporal Data Visualization.

MODULE III DATA VISUALISATION-II 09

Geospatial Data Visualization - Visualization Case Studies.

MODULE IV DATA VISUALISATION-III 09

Redesign Principles and Design Dimensionality - Hierarchical Data Visualization - Network Data Visualization.

MODULE V DATA VISUALISATION TOOLS 09

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

1. Ben Fry "Visualizing Data: Exploring and Explaining Data with the Processing Environment" O'Reilly Media, 2007.
2. Scott Murray "Interactive Data Visualization for the Web" O'Reilly Media, 2012.

3. Edward Tufte "The Visual Display of Quantitative Information" 2001.
4. Few, S, Information dashboard design: The effective visual communication of data Sebastopol: O'Reilly, 2006. 5. Provost, F. & Fawcett, T. (in-press). Towards data science: Fundamental Principles of data mining and data-analytic thinking.

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

Individual Members of the Network – Sociological Questions about Relationships – Whole Social Networks- Distributions – Multiplexity – Roles and Positions – Network Segmentation – Graph Theory – Notations for Social Network Data.

MODULE III SOCIAL NETWORK ANALYSIS FUNDAMENTALS 09

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

MODULE IV METHODS OF SOCIAL NETWORK ANALYSIS 10

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

MODULE V TOOLS AND TECHNOLOGIES 10

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

Total Hours: 45

TEXT BOOKS AND REFERENCES:

1. Charles Kadushin, “Understanding Social Networks: Theories, Concepts, and Findings”, Oxford University Press, USA, 2011.
2. David Knoke, Song Yang, “Social Network Analysis”, 2nd Edition, SAGE Publications, 2007.
3. Christina Prell , “Social Network Analysis: History, Theory and Methodology”, 1st Edition, SAGE Publications Ltd, 2012.

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.

CADY 403 HEALTH CARE ANALYTICS L T P C

3 0 0 3

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 09

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

MODULE II HEALTH CARE INFORMATION SYSTEMS 09

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 09

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 09

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

MODULE V IT INITIATIVES 09

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

Total Hours: 45

TEXT BOOKS:

1. Karen A Wager, Frances Wickham Lee, John P Glaser, " Managing Health Care Information Systems: A Practical Approach for Health Care Executives", John Wiley, 2nd edition 2009.
2. Marion J. Ball, Charlotte Weaver, Joan Kiel ,"Healthcare Information Management Systems: Cases, Strategies, and Solutions", Springer, 2010, 3 rd edition
3. Rudi Van De Velde and Patrice Degoulet, "Clinical Information Systems: A Component based approach", Springer 2005.

REFERENCE BOOKS

1. Kevin Beaver, Healthcare Information Systems, Second edition Best Practices, CRC Press, 2002.
2. Marion J. Ball Healthcare Information Management Systems: A Practical Guide Springer-Verlag GmbH, 1995.

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.

CADY 404 R PROGRAMMING L T P C

3 0 0 3

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

What is R Programming Language? Introduction & Basics- How to Download & Install R, RStudio, Anaconda on Mac or Windows- R Data Types, Arithmetic & Logical Operators with Example- R Matrix Tutorial: Create, Print, add Column, Slice- Factor in R: Categorical & Continuous Variables.

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:

1. Paul Teetor. R Cookbook: Proven recipes for data analysis, statistics, and graphics. O'Reilly Media, Inc., 2011.
2. Norman Matloff. The art of R programming: A tour of statistical software design, No Starch Press, 2011.
3. Winston Chang. R graphics cookbook. O'Reilly Media, Inc., 2012.
4. Hadley Wickham and Garrett Grolemund. R for data science. (2016).
5. Phil Spector. Data manipulation with R. Springer Science & Business Media, 2008.

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.

CADY 405 DECISION SUPPORT SYSTEMS L T P C
3 0 0 3

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

Managers and Decision Making, Managerial-Decision Making and Information Systems, Managers and Computer Support, Computerized Decision Support and the Supporting technologies, A frame work for decision support, The concept of Decision Support systems, Group Decision Support Systems, Enterprise Information Systems, Knowledge Management systems, Expert Systems, Artificial Neural Networks, Hybrid Support Systems. Decision Making Systems, Modeling, and Support: Introduction and Definitions, Systems, Models. Phases of Decision-Making Process, Decision-Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision Making: Implementation Phase.

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 09

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

MODULE V ENTERPRISE INFORMATION SYSTEMS 09

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:

1. Efraim Turban. Jay E. Aronson, Ting-Peng Liang: Decision Support Systems and Intelligent Systems, 7th Edition, Prentice-Hall of India, 2006.

REFERENCE BOOKS:

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

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.
- Analyze Group Decision Making, Communication and Collaboration, Communication Support.
- 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

Why do we need Analytics? - Analytics in decision making - Power of Analytics- Predictive Analytics - Analytics in Finance- Analytics in Manufacturing- Analytics in Healthcare- Analytics in IT- Analytics in Telecom- Analytics in Supplychain- Digital Analytics.

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

Data Partitioning, Model selection, Model Development Techniques, Neural networks, Decision trees, Logistic regression, Discriminant analysis, Support vector machine, Bayesian Networks, Linear Regression, Cox Regression, Association rules.

MODULE V MODEL EVALUATION AND DEPLOYMENT 09

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

		L	T	P	C
CADY001	**MANAGEMENT INFORMATION SYSTEMS**	**3**	**1**	**0**	**4**

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

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

MODULE II ORGANIZATIONAL STRUCTURE 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

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

MODULE IV SYSTEM SUPPORT 10

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

MODULE V DEVELOPMENT AND MANAGEMENT 09

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:

1. Gordon B. Davis, Margrethe H. Olson, Management Information Systems: Conceptual foundations, Structure and development –2nd Edition – Tata-McGraw hill International book company, 2000.

REFERENCES :

1. E.Wainright Martin, Carol V. Brown, Danial W. DeHayes, Jeffrey A. Hoffer, William C. Perkins, “Managing Information Technology” 3rd Edition, Prentice Hall International edition 1999.
2. Harold Koontz, Heinz Weihrich, “Essentials of Management”, 5th Edition, Tata McGraw Hill 1998.

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.

CADY002	ACCOUNTING AND FINANCIAL MANAGEMENT	L	T	P	C
		3	1	0	4

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 Dividend Policy- Concepts of Working Capital-Working Capital Policies-Factors affecting Working Capital-Estimation of Working Capital Requirements

Total Hours: 60

TEXTBOOKS:

1. S.N.Maheswari, “Financial and Management Accounting”, Sultan Chand & Sons, 2003.
2. I.M.Pandey, “Financial Management”, Vikas Publications, 4th Reprint, 2002.

REFERENCES:

1. S.P.Iyengar, “Cost and Management Accounting”, Sultan Chand & Co.
2. I.M.Pandey, “Elements of Management Accounting” Vikas Publishing House, 1999.

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.

CADY 003 **E-COMMERCE**

L	T	P	C
3	0	0	3

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 06

Networks and Commercial Transactions - Internet and Other Novelties - Electronic Transactions Today - Commercial Transactions - Establishing Trust - Internet Environment - Internet Advantage - World Wide Web.

MODULE II SECURITY TECHNOLOGIES 09

Why Internet Is Unsecure - Internet Security Holes - Cryptography : Objective Codes and Ciphers - Breaking Encryption Schemes - Data Encryption Standard Trusted Key Distribution and Verification - Cryptographic Applications Encryption - Digital Signature – Nonrepudiation and Message Integrity.

MODULE III ELECTRONIC PAYMENT METHODS 09

Traditional Transactions : Updating - Offline and Online Transactions - Secure Web Servers - Required Facilities - Digital Currencies and Payment Systems - Protocols for the Public Transport - Security Protocols - SET - Credit Card Business Basics.

MODULE IV ELECTRONIC COMMERCE PROVIDERS 09

Online Commerce Options - Functions and Features - Payment Systems: Electronic, Digital and Virtual Internet Payment System - Account Setup and Costs - Virtual Transaction Process - InfoHaus - Security Considerations – CyberCash: Model - Security - Customer Protection - Client Application - Selling through CyberCash.

MODULE V ONLINE COMMERCE ENVIRONMENTS 12

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:

1. Pete Loshin, “Electronic Commerce”, 4th Edition, Firewall media, An imprint of laxmi publications Pvt. Ltd., New Delhi, 2004.

REFERENCES:

1. Jeffrey F.Rayport and Bernard J. Jaworski, “Introduction to E-Commerce”, 2nd Edition, Tata Mc-Graw Hill Pvt., Ltd., 2003.
2. Greenstein, “Electronic Commerce”, Tata Mc-Graw Hill Pvt., Ltd., 2000.

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.

CADY 004 BUSINESS PROCESSES

L	T	P	C
3	0	0	3

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

Introduction – Nature of Organizations – Types of Business Organizations – Organizational Structures – Formalization – Departmentation – Span of Management – Organizational Relationships – Centralization – Organizational Culture – Forms and Outcomes – IT industry and Organizational Structures – Case Studies: Organizational Improvement - Case Studies.

MODULE II ORGANIZATIONAL OUTCOMES 09

Introduction – Nature of Power in Organizations – Outcomes of Power Relationships – Leadership – Decision Making – Communication – Organizations and Change-Structure and Management of Change in Indian Organizations – Organizational Environments – Inter-Organizational Relationships - Case Studies.

MODULE III BUSINESS PROCESS RE-ENGINEERING (BPR) 09

Introduction – Emergence of BPR – What is BPR – Framework for Reengineering– Reengineering Methodology – Advantages – Success Factors – Failure Factors– Justifying Path to Reengineering – Planning Reengineering Projects – Setting Up for Reengineering – Information Analysis – Futuristic State Design and Validation - Case Studies.

MODULE IV BPR AND IT INDUSTRY 09

Introduction – Integration of Business with Computers – Management Perceptions – Empowering People through IT – Managing Change – BPR Rediscovering Indian Paradigm – Case Studies.

MODULE V E-BUSINESS PROCESS 09

Introduction – Linking Business with Modern Technology – Trends driving E-Business – E-Business Patterns – New Era of Cross-functional Integrated Apps– Knowledge Management and Information Technology – Case studies.

Total Hours: 45

TEXTBOOKS :

1. Richard H.Hall, Organizations-Structures, Processes and Outcomes", Pearson Education, 2004.
2. M.S.Jayaramanet. Al, "Business Process Reengineering", Tata McGraw Hill Publications, 2001.
3. Ravi Kalakota and Marcia Robinson, "E-Business; Roadmap for Success; Pearson Education, 2000.

REFERENCES :

1. Gareth Jones, "Organizational Theory, Design and Change", Pearson Education, 4th Edition, 2004.
2. Dave Chaffey, "E-business and E-Commerce" Pearson Education, 2nd Edition, 2003.

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.

SEMESTER - III

		L	T	P	C
CADY 021	**GRID COMPUTING**	**3**	**0**	**0**	**3**

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 **09**

Grid Computing values and risks – History of Grid computing – Grid computing model and protocols – overview of types of Grids.

MODULE II TYPES OF GRIDS **09**

Desktop Grids : Background – Definition – Challenges – Technology – Suitability– Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight – application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.

MODULE III ARCHITECTURE AND MANAGEMENT **09**

The open Grid services Architecture – Analogy – Evolution – Overview – Building on the OGSA platform – implementing OGSA based Grids – Creating and Managing services – Services and the Grid – Service Discovery – Tools and Toolkits – Universal Description Discovery and Integration (UDDI).

MODULE IV NATIVE PROGRAMMING AND SOFTWARE APPLICATIONS **09**

Desktop supercomputing – parallel computing – parallel programming paradigms – problems of current parallel programming paradigms – Desktop supercomputing programming paradigms – parallelizing existing applications -– Grid enabling software applications – Needs of the Grid users – methods of Grid deployment – Requirements for Grid enabling software – Grid enabling software application.

MODULE V APPLICATIONS, SERVICES AND ENVIRONMENTS 09

Application integration – application classification – Grid requirements – Integrating Applications with Middleware platforms – Grid enabling Network services – managing Grid environments – Managing Grids – Management reporting – Monitoring – Data catalogs and replica management – portals – Different application areas of Grid computing.

Total Hours: 45

TEXT BOOK:

1. Ahmar Abbas, “Grid Computing, A Practical Guide to Technology and Applications”, Firewall media , 2004.

REFERENCES :

1. Joshy Joseph, Craig Fellenstein, “Grid Computing”, Pearson Education, 2004. Foster, “Grid Blue print foe new computing”.

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.

CADY 022 UNIX AND NETWORK PROGRAMMING

L	T	P	C
3	0	0	3

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 09

Overview of UNIX OS - File I/O – File Descriptors – File sharing - Files and directories – File types - File access permissions – File systems – Symbolic links- Standard I/O library – Streams and file objects – Buffering - System data files and information - Password file – Group file – Login accounting – system identification.

MODULE II PROCESSES 09

Environment of a UNIX process – Process termination – command line arguments - Process control – Process identifiers - Process relationships terminal logins – Signals -threads.

MODULE III INTERPROCESS COMMUNICATION 09

Introduction - Message passing (SVR4)- pipes – FIFO – message queues - Synchronization (SVR4) – Mutexes – condition variables – read – write locks– file locking – record locking – semaphores –Shared memory (SVR4).

MODULE IV SOCKETS 09

Introduction – transport layer – socket introduction - TCP sockets – UDP socket - raw sockets – Socket options - I/O multiplexing - Name and address conversions.

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)
2. W. Stevens, Bill Fenner, Andrew Rudoff, "Unix Network Programming",Volume 1, The Sockets Networking API, 3rd Edition, Pearson education, Nov 2003. (unit 4 & 5)

REFERENCES:

1. Meeta Gandhi,Tilak Shetty and Rajiv Shah – The 'C' Odyssey Unix –The open Boundless C ,1st Edition, BPB Publications 1992.

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.

CADY 023 MULTIMEDIA SYSTEMS AND ALGORITHMS

L	T	P	C
3	0	0	3

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 09

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

MODULE II MULTIMEDIA TOOLS 09

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

MODULE III MULTIMEDIA AND THE INTERNET 09

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

MODULE IV ALGORITHM OVERVIEW 09

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

MODULE V 2D AND 3D TRANSFORMATIONS 09

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

Total Hours: 45

TEXTBOOKS:

1. Multimedia: Making It Work – Tay Vaughan (Unit 1, Unit 2 and Unit 3)
2. Hearn D and Baker M.P, “Computer graphics – C Version”, 2nd Edition, Pearson Education, 2004 (Unit 4 and 5)

REFERENCE BOOKS:

1. Multimedia System Design – K. Andleigh and K. Thakkrar
2. Multimedia: Computing, Communication & Application – Ralf stein Metz and Klara Nahrstsedt.
3. Advanced multimedia programming – Steve Rimmer
4. Multimedia Literacy – Fred T. Hofstetter MGHill

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.

CADY 024	NETWORK SECURITY	L	T	P	C
		3	0	0	3

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 09

Building a network-Network Architecture-Network fundamentals - Network layer Overview on Software Defined Networking.

MODULE II ATTACKS AND PUBLIC KEY ENCRYPTION 09

Attacks- Services-Mechanisms-Conventional Encryption, Classical and RSA - Elliptic Curve Cryptography - Number Theory Concepts.

MODULE III MESSAGE AUTHENTICATION 09

Hash Functions - Digest Functions - Digital Signatures – Authentication Protocols

MODULE IV NETWORK SECURITY PRACTICE 09

Authentication, Applications - Electronic Mail Security - IP Security – Web Security

MODULE V SYSTEM SECURITY 09

Intruders – Viruses – Worms – Firewalls Design Principles – Trusted Systems.

Total Hours: 45

TEXT BOOK:

1. Stallings, Cryptography & Network Security - Principles & Practice, Prentice Hall, 3rd Edition 2002.

REFERENCES:

1. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons,1996.
2. Man, Young Rhee, “Internet Security”, Wiley, 2003.

3. Pfleeger&Pfleeger, “Security in Computing”, Pearson Education, 3rd Edition, 2003.

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

CADY 025 MICROPROCESSORS AND APPLICATIONS

L	T	P	C
3	0	0	3

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 MICRO PROCESSOR 09

Evolution of the Microprocessor - INTEL 8085- Introduction- Register Architecture - Memory Addressing - 8085 Addressing Modes -8085 Instruction Set -Timing Methods 8085 Pins and Signals -8085 Instruction Timing and Execution – Interrupts - DMA- Serial port-8085 Based System Design.

MODULE II INTRODUCTION TO 8086 MICROPROCESSOR 09

Introduction -8086 Architecture -8086 Addressing Modes -8086 Instruction Set – Data Movement Instructions Arithmetic and Logic Instructions – Program Control Instructions.

MODULE III 8086 MICROPROCESSOR INTERFACING 09

System Design Using 8086- Basic System concepts-Bus Cycle - Address and data bus concepts- interfacing with memories-RAM - EPROM - DRAMs - Programmed I/O : 8086-Based Microcomputer.

MODULE IV 80386 AND PENTIUM MICRO PROCESSORS 09

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 09

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:

1. Mohamed Rafiquzzaman, “Introduction to Microprocessors and Microcomputer- Based System Design” 2nd edition, CRC Press,1995.

REFERENCES:

1. Walter A.Triebel, AvtarSingh,“the 8088and8086 Microprocessors Programming, Interfacing, Software, Hardware and Applications”, Prentice Hall of India Pvt. Ltd., 2002.
2. Barry B.Brey, ”The INTEL microprocessors 8086/8088, 80186, 80286, 80386 and 80486 Architecture, Programming and Interfacing,” Prentice Hall of India, 2001.

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.

CADY 026 TCP/IP PROTOCOL SUITE

L	T	P	C
3	0	0	3

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 10

Standards – Internet – History- OSI model – Protocol suite – Addressing – Transmission media – Local Area and Wide Area Networks – Switching – Connecting devices – IP addressing.

MODULE II INTERNET PROTOCOL 10

Sub netting – Super netting – IP packets – Delivery – Routing – Routing model– Routing table – Datagram – Fragmentation – Checksum – IP Design – ARP – RARP – Internet control message protocol – Internet group management protocol.

MODULE III TRANSMISSION CONTROL PROTOCOL 08

User Datagram protocol – UDP operation – Use – UDP design – TCP services– Flow control – Error control – TCP operation and design – connection – Transition diagram – Congestion control.

MODULE IV APPLICATION LAYER AND CLIENT SERVER MODEL 08

Concurrency – BOOTP – DHCP – Domain name system – Name space – Distribution – Resolution – Messages – Telnet – Rlogin – Network Virtual Terminal – Character Set – Controlling the server – Remote login.

MODULE V APPLICATION PROTOCOLS 09

File Transfer Protocol – Connections – Communication – Simple Mail Transfer Protocol – Simple Network Management Protocol – Hyper Text Transfer Protocol– Transaction – Request and Response messages.

Total Hours: 45

TEXT BOOK :

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, Tata McGraw Hill Edition2000.

REFERENCE :

1. Douglas E. Comer, David L. Stevens, “Internetworking with TCP/IP – Volume I, II and III”, Prentice - Hall of India Pvt. Ltd., 2nd Edition 1994.

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

CADY 027 ADHOC NETWORKS

L	T	P	C
3	0	0	3

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 09

Introduction-Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum - Radio Propagation Mechanisms - Characteristics of the Wireless Channel - IEEE 802.11a,b Standard – Origin Of Ad hoc: Packet Radio Networks - Technical Challenges - Architecture of PRNETs - Components of Packet Radios – Ad hoc Wireless Networks -What Is an Ad Hoc Network? Heterogeneity in Mobile Devices - Wireless Sensor Networks - Traffic Profiles - Types of Ad hoc Mobile Communications - Types of Mobile Host Movements - Challenges Facing Ad Hoc Mobile Networks-Ad hoc wireless Internet.

MODULE II ADHOC ROUTING PROTOCOLS 09

Introduction - Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks - Classifications of Routing Protocols -Table-Driven Routing Protocols- Destination Sequenced Distance Vector (DSDV) - Wireless Routing Protocol (WRP) - Cluster Switch Gateway Routing (CSGR) - Source-Initiated On-Demand Approaches - Ad Hoc On-Demand Distance Vector Routing (AODV) - Dynamic Source Routing (DSR) -Temporally Ordered Routing Algorithm (TORA) - Signal Stability Routing (SSR) - Location-Aided Routing (LAR) - Power-Aware Routing (PAR) - Zone Routing Protocol (ZRP).

MODULE III MULTICASTROUTING IN ADHOC NETWORKS 09

Introduction - Issues in Designing a Multicast Routing Protocol - Operation of Multicast Routing Protocols - An Architecture Reference Model for Multicast Routing Protocols -Classifications of Multicast Routing Protocols - Tree-Based Multicast Routing Protocols- Mesh-Based Multicast Routing Protocols Summary of Tree-and Mesh-Based Protocols - Energy-Efficient Multicasting - Multicasting with Quality of

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

MODULE IV TRANSPORT LAYER, SECURITY PROTOCOLS 09

Introduction - Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks - Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks -Classification of Transport Layer Solutions - TCP Over Ad Hoc Wireless Networks -Other Transport Layer Protocols for Ad Hoc Wireless Networks - Security in Ad Hoc Wireless Networks - Network Security Requirements - Issues and Challenges in Security Provisioning - Network Security Attacks - Key Management - Secure Routing in Ad Hoc Wireless Networks.

MODULE V QoS AND ENERGY MANAGEMENT 09

Introduction - Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks -Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions - QoS Frameworks for Ad Hoc Wireless Networks Energy Management in Ad Hoc Wireless Networks –Introduction - Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes - System Power Management Schemes.

Total Hours: 45

TEXT BOOK:

1. C. Siva Ram Murthy and B.S. Manoj “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR, 2004.

REFERENCES:

1. C.K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR, 2001.
2. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000.

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

Image formation, Image transforms – Fourier transforms, Walsh, Hadamard, Discrete cosine, Hoteling transforms.

MODULE II IMAGE ENHANCEMENT & RESTORATION 09

Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - Degradation Model – Noise models - Spatial filtering – Frequency domain filtering.

MODULE III IMAGE COMPRESSION & SEGMENTATION 09

Compression Models - Elements of information theory - Error free Compression - Image segmentation –Detection of discontinuities - Edge linking and boundary detection - Thresholding – Region based segmentation - Morphology.

MODULE IV REPRESENTATION AND ESCRIPTION 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:

1. Gonzalez.R.C& Woods. R.E., Digital Image Processing, II Ed., Pearson Education, 2002.

REFERENCES:

1. Anil Jain.K, Fundamentals of Digital image Processing, Prentice Hall of India, 1989.
2. Sid Ahmed, Image Processing, McGraw Hill, New York, 1995.

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.

CADY 042 DATA MINING AND DATA WAREHOUSING L T P C
3 0 0 3

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 09

Databases - Data Mining Functionalities - Steps In Data Mining Process - Architecture of a Typical Data Mining Systems – Classification of Data Mining Systems - Overview of Data Mining Techniques. Data Pre-processing: Data Cleaning – Integration – Reduction – Transformation and Discretization.

MODULE II ASSOCIATION RULES 09

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 09

Clusters Analysis: Types of Data In Cluster Analysis- Categorization of Major Clustering Methods: Partitioning Methods: k-Means, k-Medoids – Hierarchical Methods: BIRCH, Chameleon – Density based Methods: DBSCAN, OPTICS, Grid based Methods: STING and CLIQUE.

MODULE IV DATA WAREHOUSING 09

Data Warehouse: Basic Concepts – Data Warehouse Modelling – Data Warehouse Design and Usage – Data Warehouse Implementation.

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 :

1. Alex Berson,Stephen J. Smith, “Data Warehousing, Data Mining,& OLAP”, Tata McGraw- Hill, 2004.
2. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances In Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
3. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
4. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.

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

CADY 043 SOFTWARE QUALITY MANAGEMENT L T P C

3 0 0 3

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 09

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 09

Need for configuration Management - Software product nomenclature - configuration management functions - Baselines - Responsibilities - Need for automated tools - plan – SCM support functions - The requirement phase Design control - The implementation phase - Test phase - SCM Tools - Configuration accounting and audit.

MODULE III SOFTWARE STANDARDS AND INSPECTION 09

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 09

Testing: principles - Types - Planning - Development - Execution and reporting– Tools and methods - Real Time testing - quality management paradigm - Quality motivation – Measurement criteria - Establishing a software quality program - Estimating software quality.

MODULE V DEFECT PREVENTION 09

Principles of software defect prevention - Process changes for defect prevention - Defect prevention considerations - Managements role - Framework for software process change - Managing resistance to software process change - Case studies.

Total Hours: 45

TEXT BOOK :

1. Watts S. Humphrey, Managing the software process, Addison Wesley, 1999.

REFERENCES :

1. Tsum S.Chow, Software Quality Assurance a Practical Approach, IEEE Computer Society press, 1985.
2. Richard E. Fairley, Software Engineering - A Practitioner's approach, McGraw Hill, 1982.

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

CADY 044 EMBEDDED SYSTEMS L T P C
3 0 0 3

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

Challenges of Embedded Systems – Embedded system design process. Embedded processors – 8051 Microcontroller, ARM processor – Architecture, Instruction sets and programming.

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

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006
2. Michael J. Pont, “Embedded C”, Pearson Education, 2007

REFERENCES:

1. Steve Heath, “Embedded System Design”, Elsevier, 2005.
2. Muhammed Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, “The 8051Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007.

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

CADY 045 BUSINESS INTELLIGENCE L T P C
3 0 0 3

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

Stages and Steps: Guide to the development steps- Business Intelligence (BI) Definition – BI Decision Support Initiatives – Development Approaches – Engineering Stages and Development Steps – Parallel Development Tracks – BI Project Team Structure – Business Case Assessment: Business Justification – Business Drivers – Business Analyst Issues – Cost-Benefit Analysis – Risk Assessment – Business Case Assessment Activities.

MODULE II ENTERPRISE INFRASTRUCTURE EVALUATION 09

Enterprise Infrastructure Evaluation: Technical Infrastructure Evaluation – The Hardware Platform – The Middleware Platform – The DBMS Platform – Technical Infrastructure Evaluation Activities – Deliverables Resulting from these Activities- Roles and Risks involved in these activities. Nontechnical Infrastructure Evaluation – The Effects of Stovepipe Development – The need for Nontechnical Infrastructure Evaluation -Enterprise architecture and Enterprise Standards - Nontechnical Infrastructure Evaluation Activities – Deliverables Resulting from these Activities - Roles and Risks involved in these activities.

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 –

Business-Focused Data Analysis – Top-Down Logical Data Modelling – Bottom-Up Source Data Analysis - Data Cleansing, Activities, Deliverables, Roles and Risks - Application Prototyping– Purposes, Best Practices, Types – Building Successful Prototypes – Applications, Deliverables, Roles and Risks – Meta Data Repository Analysis.

MODULE IV DATABASE DESIGN 09

Database Design – Differences, Logical and Physical Database Design and Activities – Deliverables, Roles and Risks - Extract/Transform/Load (ETL) Design-Implementation Strategies – Preparing for the ETL Process – Designing the Extract, Transformation, Load Programs and ETL Process Flow – Evaluating ETL Tools - ETL Design Activities – Deliverables, Roles and Risks – Meta Data Repository Design – Extract/Transform/Load Development.

MODULE V APPLICATION DEVELOPMENT 09

Application Development – Online analytical Processing Tools – Multidimensional Analysis Factors – Online Analytical Processing Architecture – Development Environments – Application Development Activities – Deliverables, Roles and Risks - Data Mining – Meta Data Repository Development.

Total Hours: 45

TEXT BOOK:

1. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision Support Applications, Larissa T. Moss, ShakuAtre, Addison Wesley Publications, 2003.

REFERENCE:

1. Business Intelligence Strategy – A practical Guide for Achieving BI Excellence, John Boyer, Bill Frank, Brian Green Tracy Harris and Kay Van De Vanter, First Edition, IBM Corporation, 2010.

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

CADY 046 SOFTWARE TESTING L T P C
3 0 0 3

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

Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics.

MODULE II ROLE OF TESTING IN SDLC 09

Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic).

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

Test Organization: Test teams, tasks and Qualifications: Test Planning : Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria: Cost and economy Aspects: Test Strategies: Preventive versus Reactive Approach, Analytical versus heuristic Approach Test Activity Management, Incident

Management, Configuration Management Test Progress Monitoring and Control: Specialized Testing: Performance, Load, Stress & Security Testing.

MODULE V TESTING TOOLS 09

Automation of Test Execution, Requirement tracker, High Level Review Types of test Tools: Tools for test management and Control, Test Specification, Static Testing, Dynamic Testing, Non-functional testing.

Total Hours: 45

REFERENCES:

1. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors.
2. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R, Pearson Ed, 2006.
3. Foundations of Software Testing by Aditya P. Mathur – Pearson Education custom edition 2000.
4. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley, 1996.
5. Software Engineering – A practitioner's approach by Roger S. Pressman, 5th Edition, McGraw Hill.
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

CADY 047 CONTENT MANAGEMENT SYSTEMS L T P C
3 0 0 3

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 09

Content Management System (CMS) – Introduction - Getting Started - CMS versus website builder – Creating Pages and Navigation.

MODULE II DESIGN AND FUNCTION 09

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

MODULE III WORKSHOP AND TROUBLESHOOTING 09

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

MODULE IV WEB PAGE ADMINISTRATION 09

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 09

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.

Total Hours: 45

TEXT BOOKS:

1. CMS Made simple 1.5, Sofia Hauschildt, 2010
2. Joomla! 1.5: A User's Guide – Barrie M. North Second Edition, Prentice Hall.

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, ad 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 09

Fundamentals of C Programming – Control Statements – String - Arrays - Functions - Pointers - Structures - File Structures - File Handling.

MODULE II C++ FUNDAMENTALS 09

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

MODULE III JAVA PROGRAMMING 09

JAVA FUNDAMENTALS: Java I/O streaming – filter and pipe streams – Byte Code interpretation - Threading –Swing - Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI – IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation.

MODULE IV MULTI-TIER APPLICATION DEVELOPMENT 09

Server-side programming – servlets – Java Server Pages - Applet to Applet communication – applet to Servlet communication - JDBC – Applications on databases – Multimedia streaming applications – Java Media Framework.

MODULE V ENTERPRISE APPLICATIONS 09

Server Side Component Architecture – Introduction to J2EE – Session Beans– Entity Beans – Persistent Entity Beans .

Total Hours: 45

TEXT BOOKS:

1. Elliotte Rusty Harold, " Java Network Programming", O'Reilly publishers 2000.
2. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.
3. Hortsmann& Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002.

REFERENCES:

1. Web reference: http://java.sun.com.
2. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill, 2003.

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.

Total Hours: 45

TEXT BOOK & REFERENCES

1. G.Somasundaram, Alok Shrivastava, EMC Education Series,“ Information Storage and Management”, Wiley, Publishing Inc., 2011.
2. RobertSpalding,“StorageNetworks:The Complete Reference”, TataMcGrawHill, Osborne, 2003.
3. Marc Farley, “Building Storage Networks”,Tata McGraw Hill, Osborne. 2001.
4. MeetaGupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002

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.

CADY 050 SEMANTIC WEB L T P C

3 0 0 3

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 09

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies –Semantic Modelling - Potential of semantic web solutions and challenges of adoption.

MODULE II ONTOLOGICAL ENGINEERING 09

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects – Subclasses and Sub-properties definitions – Upper Ontologies – Quality – Uses- Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning.

MODULE III STRUCTURING AND DESCRIBING WEB RESOURCES 09

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modelling for Combinations and Patterns- Transitivity.

MODULE IV WEB ONTOLOGY LANGUAGE 09

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic.

MODULE V SEMANTIC WEB TOOLS AND APPLICATIONS 09

Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Wikis - Semantic Web Services – Modelling and aggregating social network data - Ontological representation of social relationships, Aggregating and reasoning with social network data

Total Hours: 45

TEXT BOOK & REFERENCE BOOKS:

1. Michael C.Daconta, Leo J. Obart and Kevin J Smith, “Semantic Web – A guide to the future of XML, Web Services and Knowledge Management”, Wiley Publishers, 2003. Liyang Yu, “A Developer's Guide to the Semantic Web”, Springer, First Edition, 2011
2. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, “Semantic Web Programming”, Wiley, First Edition, 2009.
3. Grigoris Antoniou, Frank van Harmelen, “A Semantic Web Primer”, Second Edition (Cooperative Information Systems) (Hardcover), MIT Press, 2008
4. Robert M.Colomb, “Ontology and the Semantic Web”, Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications), IOS Press, 2007.
5. Dean Allemang and James Hendler, “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Morgan Kaufmann”, Second Edition, 2011.
6. Michael C. Daconta, Leo J. Obrst and Kevin T. Smith, “The Semantic Web: A Guide to the Future of XML,Web Services, and Knowledge Management”,Wiley, First Edition 2003.

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

CADY 051 ENTERPRISE RESOURCE PLANNING L T P C
3 0 0 3

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

Integrated Management Information Seamless Integration – Supply Chain Management – Integrated Data Model – Benefits of ERP – Business Engineering and ERP – Definition of Business Engineering – Principle of Business Engineering – Business Engineering with Information Technology.

MODULE II BUSINESS MODELLING FOR ERP 09

Building the Business Model – ERP Implementation – An Overview – Role of Consultant, Vendors and Users, Customisation – Precautions – ERP Post Implementation Options-ERP Implementation Technology –Guidelines for ERP Implementation.

MODULE III ERP AND THE COMPETITIVE ADVANTAGE 09

ERP domain MPGPRO – IFS/Avalon – Industrial and Financial Systems – Baan IV SAP-Market Dynamics and Dynamic Strategy.

MODULE IV COMMERCIAL ERP PACKAGE 09

Description – Multi-Client Server Solution – Open Technology – User Interface-Application Integration.

MODULE V ARCHITECTURE 09

Basic Architectural Concepts – The System Control Interfaces – Services – Presentation Interface – Database Interface.

Total Hours: 45

TEXT BOOK:

1. Vinod Kumar Garg and N.K.Venkita Krishnan, “Enterprise Resource Planning – Concepts and Practice”, PHI, 1998.

REFERENCE:

1. Jose Antonio Fernandz, The SAP R/3 Handbook, TMH, 1998.

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.

CADY 052 SOFTWARE PROJECT MANAGEMENT L T P C
3 0 0 3

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

Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models-The SEI CMM - International Organization for Standardization.

MODULE II DOMAIN PROCESSES 09

Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project - Project Planning -Creating the Work Breakdown Structure - Approaches to Building a WBS -Project Milestones - Work Packages - Building a WBS for Software.

MODULE III SOFTWARE DEVELOPMENT 09

Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.

MODULE IV SCHEDULING ACTIVITIES 09

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Levelling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.

MODULE V QUALITY ASSURANCE 09

Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study.

Total Hours: 45

TEXT BOOK :

1. Robert T. Futrell, Donald F. Shafer, Linda I. Safer, “Quality Software Project Management”, Pearson Education, Asia, 2002.

REFERENCES :

1. Pankaj Jalote, “Software Project Management in Practice”, Addison Wesley, 2002.
2. Hughes, “Software Project Management, 3/E”, Tata McGraw-Hill, 2004.

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 describes 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 09

Unix operating system - History - System structure –Users Perspective- OS Services- Hardware-Architecture- System Concepts- Kernel data structures– System Administration – Buffer Cache- Heaters – Structure of the Buffer Pool-Scenarios-Reading and writing Disk Blocks.

MODULE II FILE SYSTEMS 09

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 09

Process States and Transitions – Layout of System Memory – Context of a Process – Manipulation of the process address space – Sleep – Process Control– Creation – Signals – Awaiting process termination – The Shell – System Boot and Init Process – Process Scheduling and Time – System calls for time – Clock.

MODULE IV MEMORY MANAGEMENT 09

Swapping – Segmentation - Demand Paging – Driver Interfaces – Disk Drivers – Terminal Drivers - Streams.

MODULE V INTERPROCESS COMMUNICATION 09

Process Tracing – System V IPC – Network Communications - Sockets – Problem of Multiprocessor Systems – Solution with Master and Slave Processors– Semaphores – Distributed Unix Systems – Satellite Processors-– Newcastle connection – Transparent distributed file systems – System Calls.

Total Hours: 45

TEXT BOOK :

1. Bach M.J., The Design of the Unix Operating System, Prentice Hall India, 1986.

REFERENCES :

1. Good heart B., Cox.J., The Magic Garden Explained, Prentice Hall India, 1994.
2. Leffler S.J., Mckusick M.K., Karels M.J and Quarterman J.S., The Design and Implementation of the 4.3 BSD Unix Operating System. Addison Wesley, 1998.

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 L T P C
3 0 0 3

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 09

Relational Model - Querying - Storage Structures - Query Processing- Normalization.

MODULE II OBJECT ORIENTED DATABASES 09

Introduction to Object Oriented Data Bases - Approaches - Modelling and Design - Persistence - Transaction - Concurrency - Recovery - Database Administration.

MODULE III EMERGING SYSTEMS 09

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

MODULE IV CURRENT ISSUES 09

Rules - Knowledge Bases - Active and Deductive Databases - Distributed Databases and Parallel databases.

MODULE V DATABASE DESIGN ISSUES 09

Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues.

Total Hours: 45

TEXT BOOK :

1. R. Elmasri and S.B. Navathe, Fundamentals of Database Systems, Addison Wesley, 2000.

REFERENCES :

1. Gary W. Hanson and James V. Hanson, Database Management and Design, Prentice Hall of India Pvt Ltd, 1999.
2. Alex Benson, Stephen Smith and Kurt Thearling, Building Data Mining Applications for CRM, Tata McGraw-Hill, 2000.

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.

CADY 073 SOFTWARE QUALITY ASSURANCE L T P C
3 0 0 3

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

Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools - 7 QC Tools and Modern Tools; Other related topics - Business Process Re-engineering –Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

MODULE II SOFTWARE ENGINEERING CONCEPTS 09

Software Engineering Principles, , Software Process, Project and Product Metrics, Risk Management, Software Quality Assurance; Statistical Quality Assurance - Software Reliability, Muse Model; Software Configuration Management; Software Testing; CASE (Computer Aided Software Engineering).

MODULE III QUALITY ASSURANCE MODELS 09

Models for Quality Assurance-ISO-9000 - Series, CMM, SPICE, Malcolm Baldrige Award.

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 :

1. Watts Humphery, “Managing Software Process", Addison - Wesley, 1998.

REFERENCES:

1. Philip B Crosby, "Quality is Free: The Art of Making Quality Certain", Mass Market, 1992.
2. Roger Pressman, “Software Engineering ", Sixth Edition, McGraw Hill, 2005.

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.

CADY074 SERVICE ORIENTED ARCHITECTURE L T P C
3 0 0 3

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 09

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation.

MODULE II SERVICE LAYER 09

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration –Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer.

MODULE III SERVICE ORIENTED ANALYSIS AND DESIGN 09

Service oriented analysis – Business-centric SOA – Deriving business services-service modelling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Task centric business service design.

MODULE IV TECHNOLOGIES AND DESIGN FOR SOA 09

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

Enhancements (WSE).Service design-guidelines- WS-BPEL language basics – WS-Coordination overview – WS -Choreography, WS-Policy, WS Security-WSOA platform-SOA support in J2EEand .NET.

MODULE V SERVICE DESIGN AND SECURITY 09

Service design-guidelines- WS-BPEL language basics – WS-Coordination overview – WS -Choreography, WS-Policy, WS Security-WSOA platform-SOA support in J2EEand .NET.

Total Hours: 45

TEXT BOOK:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005.

REFERENCES:

1. Thomas Erl, “SOA Principles of Service Design “(The Prentice Hall Service-Oriented Computing Series from Thomas Erl), 2005.
2. Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services, An Architect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern, “Enterprise SOA Designing IT for Business Innovation” O’REILLY, First Edition, 2006.

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

CADY 075 C# AND .NET FRAMEWORKS L T P C
3 0 0 3

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 09

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

Total Hours: 45

TEXT BOOKS:

1. S. Thamarai Selvi and R. Murugesan “A Textbook on C# “, Pearson Education, 2003.
2. Stephen C. Perry “ Core C# and .NET”, Pearson Education, 2006.

REFERENCES:

1. Jesse Liberty, “Programming C#”, Second Edition, O’Reilly Press, 2002.
2. Robinson et al, “Professional C#”, Fifth Edition, Wrox Press, 2002.
3. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw Hill, 2004.
4. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
5. Thuan Thai and Hoang Q. Lam, “.NET Framework Essentials”, Second Edition, O’Reilly, 2002.

OUTCOMES:

On completion of this course, students will be able to

- List the major elements of the .NET frame work
- 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

CADY 076 PHP PROGRAMMING L T P C
3 0 0 3

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 09

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 09

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 09

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 09

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

MODULE V PHP APPLICATION FRAMEWORKS 09

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

Total Hours: 45

TEXT BOOK:

1. Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, “Programming PHP”, Creating Dynamic Web Pages, O'Reilly Media, 3rd Edition, 2013.

REFERENCES:

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

OUTCOMES:

On completion of this course, students will be able to

- Design a web project to use real-time processing capabilities to interact with a database.
- test and debug 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.

CADY 077 ONLINE COMPUTER ADVERTISING L T P C
3 0 0 3

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 A d 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

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

MODULE V BUYING AND SELLING ONLINE ADS 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

1. Joe Plummer, Steve Rappaport, Taddy Hall, and Robert Barocci, The Online Advertising Playbook, John Wiley & Sons, Inc. (Hoboken, New Jersey), 2007
2. Robbin Zeff and Brad Aronson (ZA book from here on), *Advertising on the Internet,* 2nd edition*,* John Wiley & Sons, Inc. (New York, NY), 1999.

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

CADY 078 **WEB MINING** **L T P C**
3 0 0 3

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

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

MODULEII WEB USAGE MINING 09

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

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:

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

2. Data Mining: Practical Machine Learning Tools and Techniques, by Ian Witten and Eibe Frank, 3rd Ed., Morgan Kaufmann, 2011
3. Web Data Mining: Exploring Hyperlinks, Content, and Usage Data, by Bing Liu, 2nd Edition, , Springer, 2011
4. Building an Intelligent Web: Theory & Practice, R. Akerkar& P. Lingras; Jones & Bartlett, 2007.
5. Mining the Web, Discovering Knowledge from Hypertext Data, Soumen Chakrabarti, Morgan Kaufmann Publishers, 2003.

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.

CADY 079 DIGITAL MARKETING L T P C

3 0 0 3

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 08

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

MODULE II BUILDING WEBSITE AND SEARCH ENGINE OPTIMIZATION 10

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

MODULE III ONLINE DISPLAY ADVERTISING AND ECOMMERCE MARKETING 09

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

CADY 080 INFORMATION RETRIEVAL L T P C
3 0 0 3

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

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

MODULE III WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING 09

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

MODULE IV WEB SEARCH – LINK ANALYSIS AND 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 09

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

Total Hours: 45

TEXT BOOKS:

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro – Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

REFERENCES:

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

OUTCOMES:

On Completion of the course the students will be able to

- Apply information retrieval models
- Design Web Search Engine
- Use Link Analysis
- Use Hadoop and Map Reduce
- Apply document text mining techniques

CADY 081 HUMAN COMPUTER INTERACTION L T P C
3 0 0 3

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 09

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

MODULE II DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS 09

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 09

Programming Tools–Windowing systems–Interaction tool kit–Evaluation techniques – evaluation design – Evaluating implementations – Observational Methods, text and messages, Icons–Multimedia, colours, uses problems, choosing colours.

MODULE IV MODELS 09

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

technical models – Communication and Collaboration models – Task models – Task analysis and design.

MODULE V EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI 09

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

Total Hours: 45

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010. REFERENCE:.
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,
3. User Interface Design, SorenLauesen , Pearson Education.

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

CADY 082 BIO-INFORMATICS L T P C
3 0 0 3

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 09

Introduction to molecular biology – the genetic material – gene structure – protein structure – chemical bonds – molecular biology tools – genomic information content.

MODULE II ALIGNMENTS 09

Data searches – simple alignments – gaps – scoring matrices – dynamic programming – global and local alignments – database searches – multiple sequence alignments Patterns for substitutions – estimating substitution numbers– evolutionary rates – molecular clocks – evolution in organelles.

MODULE III PHYLOGENETICS 09

Phylo-genetics –history and advantages–phylo-genetic trees–distance matrix methods – maximum likelihood approaches – multiple sequence alignments – Parsimony – ancestral sequences – strategies for faster searches – consensus trees – tree confidence – comparison of phylo-genetic methods – molecular phylogenies.

MODULE IV GENE STRUCTURE 09

Genomics –prokaryotic genomes: prokaryotic gene structure–GC content–gene density – eukaryotic genomes: gene structure – open reading frames – GC content – gene expression – transposition – repeated elements – gene density.

MODULE V PROTIENS AND PREDICTION 09

Amino acids – polypeptide composition – secondary structure – tertiary and quaternary structure – algorithms for modelling protein folding – structure prediction – predicting RNA secondary structures Proteomics – protein classification –

experimental techniques – inhibitors and drug designing and screening – NMR structures – empirical methods and prediction techniques – post-translational modification prediction

Total Hours : 45

TEXT BOOK:

1. D. E. Krane and M. L. Raymer, “Fundamental concepts of Bioinformatics”, Pearson Education, 2003.

REFERENCES:

1. Arthur M. Lesk, “Introduction to Bioinformatics”, Second Edition, Oxford University Press, 2005.
2. T. K. Attwood, D. J. Parry-Smith, and S. Phukan, “Introduction to Bioinformatics”, Pearson Education, 1999.
3. Vittal R. Srinivas, “Bioinformatics – A Modern Approach”, Prentice-Hall of India Pvt.Ltd., 2005.

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.