ACADEMIC REGULATIONS,

COURSE STRUCTURE & SYLLABI

FOR

M. Tech. (COMPUTER NETWORKS AND INFORMATION SECURITY)

Two Year PG Day-Time Program
(with effect from 2019 – 20)

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(AUTONOMOUS)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Kukatpally, Hyderabad – 500 085 TELANGANA.

SCHOOL OF INFORMATION TECHNOLOGY
(AUTONOMOUS)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Kukatpally, Hyderabad – 500 085, Telangana (India)

ACADEMIC REGULATIONS FOR THE AWARD OF M.Tech. DEGREE BASED ON CHOICE BASED CREDIT SYSTEM (CBCS) (WITH EFFECT FROM THE ACADEMIC YEAR 2019 – 2020)

The Master of Technology (M.Tech.) Post Graduate Degree of the Jawaharlal Nehru Technological University Hyderabad (JNTUH) shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

JNTUH offers 2 Years (4 Semesters) Master of Technology (M.Tech.) Post Graduate Degree program, under Choice Based Credit System (CBCS) at its constituent Autonomous College – ***JNTUH, SCHOOL OF INFORMATION TECHNOLOGY (JNTUH SIT),*** Hyderabad in the following specializations

S.No.	Specialization
1	Computer Science(CS)
2	Software Engineering(SE)
3	Computer Networks & Information Security(CNIS)
4.	Data Science(DS)

1. ELIGIBILITY FOR ADMISSIONS

Admission to the above shall be made subject to eligibility, qualification and specialization as prescribed by the University for each Program, from time to time.

Admissions shall be made on the basis of merit rank obtained by the qualifying candidate on the basis of Valid GATE score or at an Entrance Test (TSPGECET) conducted by TELANGANA State Government, subject to reservations prescribed by the University time to time through Directorate of admissions JNTUH.

2. AWARD OF M. Tech. DEGREE

2.1 A candidate shall be declared eligible for the award of the M. Tech. Degree, if candidate pursues a course of study in not less than two and not more than four academic years.

2.2 A candidate who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his/her admission shall forfeit his/her seat in M. Tech. course.

3. M.TECH. PROGRAMS STRUCTURE

3.1 The M.Tech. Programs of SIT-JNTUH are of Semester Pattern, with 4 Semesters constituting 2 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations).

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.3 Semester Scheme: Each PG program is of 2 Academic Years (4 Semesters), with the year being divided into two Semesters of 22 weeks ($\geq$ 90 working days) each, each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.

3.4 Credit Courses: Subjects/ Courses are to be registered by a candidate in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a L: P: C (Lecture Periods: Practical Periods: Credits) Structure, based on the following general pattern.

One Credit - for One hour/ Week/ for Theory/ Lecture (L) Courses

One Credit - for Two hours/ Week/ for Laboratory/ Practical (P) Courses

4. COURSE WORK

4.1 A candidate after securing admission shall pursue the M.Tech. in a minimum period of 2 Academic Years, and a maximum period of 4 Academic Years (starting from the Date of Commencement of I Year).

4.2 Each candidate shall register for and secure the specified number of Credits required for the completion and award of the M.Tech. Degree in respective specialization.

4.3 Each of I Year I Semester and II Semester offers 19 Credits (I Year = 2 X 19 =38C) and II Year I Semester and II Semester offer 16 Credits (II Year = 2 X 16 = 32C) each, totaling to 70 Credits (70C) for the entire M.Tech. Program.

4.4 The candidate shall register for all 70 credits and secure all the 70 credits.

5. COURSE REGISTRATION

5.1 A 'Course Coordinator or Faculty Advisor' shall be assigned to each candidate, who will advise him/her about the M.Tech. Program, its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his/her competence, progress, pre-requisites and interest.

5.2 Academic Section of the College invites 'Registration Forms' from candidate's apriori (before the beginning of the Semester). The Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.3 A candidate can register, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Course Coordinator, which should be submitted to the College Academic Section.

5.4 A candidate may be permitted to register for Subjects/ Course of his/her CHOICE with a typical total of 19 Credits per Semester (I & II Semesters): **Minimum being 16 Credits and Maximum being 22 Credits**, based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses, in the Department Course Structure and Syllabus contents. A candidate must register all the CORE subjects/courses.

5.5 The candidate has to register for the audit course(s) and must pass the audit course(s) for successful completion of the degree. However the credits earned in the audit courses are not included in the computation of the SGPA/CGPA

5.6 Choice for 'additional Subjects/ Courses' to reach the Maximum Permissible Limit of 22 Credits (above the typical 19 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Course Coordinator.

5.7 If the Candidate submits ambiguous choices or multiple options or erroneous entries during Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

5.8 Subject/ Course Options exercised are final and CAN NOT be changed. However, if the Subject/ Course that has already been listed for Registration (by the Course Coordinator) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Candidate shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Course Coordinator, with due notification and time framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.9 Dropping of Subjects/ Courses may be permitted, ONLY AFTER obtaining prior approval from the Course Coordinator/Faculty Advisor (subject to retaining a minimum of 16 C), 'within 15 Days of Time' from the beginning of the current Semester.

5.10 Candidates may register for NPTEL/SWAYAM as per the university rules.

6.0 SUBJECTS/ COURSES TO BE OFFERED

6.1 A Subject/ Course may be offered to the Candidates, ONLY IF a Minimum of 1/3rd of the Section Strength) opt for the same.

6.2 More than ONE TEACHER may offer the SAME SUBJECT (Lab/ Practicals may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for candidates will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion'.

6.3 If more entries for Registration of a Subject come into picture, then the concerned Course Coordinator shall take necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.4 In case of options coming from Candidates of other Departments/ Branches/ Disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the candidate of the 'Parent Department' first.

7. ATTENDANCE

7.1 The candidate shall put in a minimum of 75% attendance per semester independently for each of the course/subject registered.

7.2 Condonation of shortage of attendance up to 10% in each course/subject registered (65% and above and less than 75%) may be given by the College/school Academic Committee.

7.3 Shortage of Attendance below 65% shall not be condoned. Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence and by paying stipulated fee.

7.4 Candidates whose shortage of attendance is not condoned in any course/subject registered are not eligible to write their end semester examination of that course/subject, they get **DETAINED** in that course/subject. The candidate will have to repeat that course/subject as and when offered; in case if there are any Professional Electives and/or Open Electives, the same may also be re-registered if offered, however, if those electives are not offered in later semesters, then alternate electives may be chosen from the SAME set of ELECTIVE subjects offered under that category. In such a case candidate has to pay tuition fee for that course/subject.

7.5 A Candidate shall put in a minimum required attendance in at least three (3) theory subjects in each semester for promoting to next Semester. In order to qualify for the award of the M.Tech Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

8. EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

8.1 Evaluation of a candidate in a course/subject involves both external and internal components. External evaluation will be in the form of end semester examination in a

course/subject for which is 60 marks are allocated. The remaining 40 marks are allocated to internal evaluation.

8.2 The internal evaluation has two Mid Term-Examinations (each of 40 marks). They are conducted as one in the middle of the Semester and the other immediately after the completion of instructions. Each midterm examination shall be conducted for a total duration of 120 minutes. The best one will be considered.

8.3 The End semester Examination will be conducted in each subject for 60 marks. The question paper consists of 8 questions. Each of these questions may contain sub-questions. Each question carries 12 marks. The candidate will be required to answer 5 questions. The questions are to be prepared to cover the entire range of prescribed syllabi of the subjects and units.

8.4 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded based on the day-to-day performance in the lab and the performance in internal lab examination.

8.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum aggregate of 50% of the total marks in the Semester End Examination and Internal Evaluation taken together.

8.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 8.5) he has to reappear for the Semester End Examination in that subject.

8.7 A candidate can re-register for the subjects, if the internal marks secured by a candidate is less than 50% and failed in that subject for maximum of two subjects and should register within four weeks of commencement of the class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the Semester End Examination in those subjects. In the event of the candidate taking another chance, his Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stands cancelled.

9. Evaluation of Project / Dissertation Work

Every candidate shall be required to submit the thesis or dissertation after taking up a topic approved by the School/College.

9.1 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).A candidate has to choose the topic thesis in the first **2** weeks of the II Year I Semester in consultation with the Internal/External guides. After 2 weeks candidate has to submit an abstract of work to be carried out to the Project Review Committee (PRC), which in turn allows the candidate to register for thesis work if it is satisfied with the abstract submitted by the candidate.

9.2 A Project Review Committee (PRC) shall be constituted with Course Coordinator and other faculty members from the school.

9.3 Only after obtaining the approval of Project Review Committee (PRC), the candidate can initiate the Project work.

9.4 If a candidate wishes to change his supervisor or topic of the project he can do so with the approval of a committee appointed by the Director, SIT. However, the committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

9.5 The total duration of the project is for 44 weeks which is spread across 22weeks in II Year I semester and 22 Weeks in II year II semester. The candidate can submit the final project only after 40 weeks from the date of registration after the approval of PRC.

9.6 Internal Evaluation of the project shall be on the basis of the seminars (Project reviews) conducted during the II Year I semester and II semesters by the Project Review Committee (PRC). In II Year I semester two seminars are conducted and in II Year II semester two seminars are conducted.

9.7 At end of the II Year I semester, a candidate shall submit status report in a spiral bound copy form. Internal marks are for 40 marks which will be awarded by an internal committee consists of the concerned guide, course coordinator and a faculty member appointed by the Director, SIT. External marks are for 60 marks which will be awarded by an external examiner appointed by the Director, SIT. Evaluation of project by Internal Committee (for 40 marks) and by the external examiner (for 60 marks) will be done simultaneously. **One publication is mandatory in Journal or conference for submission of the thesis.**

9.8 At the end of the II Year II semester, after approval from the PRC, the soft copy of the thesis should be submitted for ANTI-PLAGIARISM for the quality check and the plagiarism report should be included in the final thesis. If the copied information is less than 24%, then only thesis will be accepted for submission. A candidate shall submit the thesis/dissertation in a hard bound copy form. He will attend for the viva-voce. An external examiner appointed by the Director will evaluate the project for 100 marks. There will be no internal marks for phase II of the project.

9.9 The candidate has to submit two hard copies and one soft copy of Thesis/Dissertation, certified in the prescribed format by the supervisor to the school.

9.10 The Thesis/Dissertation will be adjudicated by one external examiner selected by the competent authority.

9.11 In case the candidate fails in viva-voce examination, based on the recommendation of the board the candidate has to retake the viva-voce examination after three months. If he fails in this viva-voce examination also, he will not be eligible for the award of the degree unless the candidate is asked to revise and resubmit.

10. Examinations and Assessment - The Grading System

10.1 Marks will be awarded to indicate the performance of each candidate in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

10.2 As a measure of the candidate's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

Marks Obtained	Grade	Description of Grade	Grade Points (GP) Value Per Credit
>=90	O	Outstanding	10
>=80 and <90	A+	Excellent	9
>=70 and <80	A	Very Good	8
>=60 and <70	B+	Good	7
>=55 and <60	B	Average	6
>=50 and <55	C	Pass	5
<50	F	Fail	0
Not Appeared the Exam(s)	AB	Absent	0

10.3 A candidate obtaining F Grade in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

10.4 A candidate not appeared for examination then 'AB' Grade will be allocated in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

10.5 A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

10.6 In general, a candidate shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

10.7 A candidate earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Subject

10.8 The Candidate passes the Subject/ Course only when he **gets GP ≥ 5 (C Grade or above).**

10.9 The Grade Point Average (GPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects registered in a Semester or for the Exam appeared (like supplementary), by the Total Number of Credits registered during that Semester or for the Exam appeared (like supplementary). GPA is rounded off to FOUR Decimal Places. GPA is thus computed as

$$\text{GPA} = \frac{i \times GP_i}{i\ C_i}$$

Where n is the number of subjects Registered in that semester / exam.

is Credits for the subjects.

GP_i is the grade point obtained for the subject

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester or for the Exam appeared), 'N' is the no. of Subjects 'REGISTERED' for the Semester or for the Exam appeared, C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

10.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a candidate over all Subjects in all considered for registration. The CGPA is the ratio of the Total Credit Points secured by a candidate in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to FOUR Decimal Places. CGPA is thus computed as per the formula

$$\text{CGPA} = \frac{\sum_1^m GPA_j \times TC_j}{\sum_{j=1}^m TC_j}$$

where m is the number of subjects registered in the course.

TC_j the total number of credits for a j^{th} subject.

GPA_j is the Grade point of the j^{th} subject.

10.11 For Calculations listed in Item 10.6 – 10.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations.

11. AWARD OF DEGREE AND CLASS

11.1 A Candidate who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG (PGP), and secures the required number of **70** Credits (with CGPA ≥ 5.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

11.2 Award of Class

After a candidate has satisfied the requirements prescribed for the completion of the Degree and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	**CGPA**
First Class with Distinction	≥ 8.00
First Class	$7.00 \leq \text{CGPA} < 8.00$
Second Class	$5.00 \leq \text{CGPA} < 7.00$

11.3 A candidate with final CGPA (at the end of the PGP) < 5.00 will not be eligible for the Award of Degree.

12. WITHHOLDING OF RESULTS

12.1 If the candidate has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result of the candidate will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

13. TRANSITORY REGULATIONS

13.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for admission to maximum of two earlier or equivalent subjects at a time as and when offered.

13.2 In case any candidate makes a re-registration then the academic regulations which were applicable for the year of his joining year will be applicable.

14. GENERAL

14.1 Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

14.2 Credit Point: It is the product of grade point and number of credits for a course.

14.3 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her".

14.4 The academic regulation should be read as a whole for the purpose of any interpretation.

14.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

14.6 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the candidates with effect from the dates notified by the University.

15.0 MALPRACTICES RULES

15.1 DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters

		from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of candidates of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical Examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If candidate of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Candidate of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted

		for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

15.2 Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions:

(if the squad reports that the college is also involved in encouraging malpractices)

(i) A show cause notice shall be issued to the college.
(ii) Impose a suitable fine on the college.
(iii) Shifting the examination centre from the college to another college for a specific period of not less than one year

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(Autonomous)
MASTER OF TECHNOLOGY- COMPUTER NETWORKS AND INFORMATION SECURITY
I YEAR I SEMESTER

S. No.	Subject Code	Subject	L	T	P	Total Marks(100)		Credits
						Int	Ext	
1.	CN1C10	**Core-1:** Data Structures and Algorithms	3	-	-	40	60	3
2.	CN1C20	**Core-2:** Principles of Information Security	3	-	-	40	60	3
3.	CN1C30	**Core-3:** Computer Networking	3	-	-	40	60	3
4.	CN1E10	**Elective-1**	3	-	-	40	60	3
	CN1E11	Internet of Things						
	CN1E12	Mobile Application Development						
	CN1E13	Data Mining						
	CN1E14	Internet Technologies and Services						
	CN1E15	Advanced Programming						
5.	CN1E20	**Elective-2**	3	-	-	40	60	3
	CN1E21	Distributed Systems						
	CN1E22	Database Systems						
	CN1E23	Information Retrieval Systems						
	CN1E24	Artificial Intelligence						
	CN1E25	Software Engineering						
6.	CN1L10	**Lab-1 :**Data Structures and Algorithms Through Java Lab	-	-	4	40	60	2
7.	CN1L20	**Lab-2(Based on Elective -1)**	-	-	4	40	60	2
	CN1L21	Internet of Things Lab						
	CN1L22	Mobile Application Development Lab						
	CN1L23	Data Mining Lab						
	CN1L24	Internet Technologies and Services Lab						
	CN1L25	Advanced Programming Lab						
8.	CN1A10	**Audit-1**	2	-	-	40	60	0
	CN1A11	Foundations of Computer Science						
	CN1A12	Professional Communication Skills						
	CN1A13	Personality Development through Life Enlightenment Skills.						
	CN1A14	Value Education						
	CN1A15	Constitution of India						
		Total	17	-	8			19

JNTUH SCHOOL OF INFORMATION TECHNOLOGY

(Autonomous)

MASTER OF TECHNOLOGY- COMPUTER NETWORKS AND INFORMATION SECURITY

I YEAR II SEMESTER

S. No.	Subject Code	Subject	L	T	P	Total Marks(100)		Credits
						Int	Ext	
1.	CN2C10	**Core-4:** Adhoc and Sensor Networks	3	-	-	40	60	3
2.	CN2C20	**Core-5:** Applications of Network Security	3	-	-	40	60	3
3.	CN2C30	**Core-6:** Machine Learning	3	-	-	40	60	3
4.	CN2E10	**Elective-3:**	3	-	-	40	60	3
	CN2E11	Mobile Computing						
	CN2E12	Computer Forensics						
	CN2E13	Software Quality Assurance and Testing						
	CN2E14	Data Science						
	CN2E15	Ethical Hacking						
5.	CN2E20	**Elective-4:**	3	-	-	40	60	3
	CN2E21	IT Security Metrics						
	CN2E22	Wireless Security						
	CN2E23	Information Systems Control and Audit						
	CN2E24	Cloud Computing						
	CN2E25	Cryptanalysis						
6.	CN2L10	**Lab-3:** Network Simulation & Network Security Lab	-	-	4	40	60	2
7.	CN2L20	**Lab-4(Based on Elective -3):**	-	-	4	40	60	2
	CN2L21	Mobile Computing Lab						
	CN2L22	Computer Forensics Lab						
	CN2L23	Software Testing Lab						
	CN2L24	Data Science Lab						
	CN2L25	Ethical Hacking Lab						
8.	CN2A10	**Audit-2:**	2	-	-	40	60	0
	CN2A11	English for Research Paper Writing						
	CN2A12	Disaster Management						
	CN2A13	Soft Skills						
	CN2A14	Stress Management by Yoga						
	CN2A15	Sanskrit for Technical Knowledge						
	CN2A16	Research Methodology						
		Total	17	-	8			19

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(Autonomous)
MASTER OF TECHNOLOGY- COMPUTER NETWORKS AND INFORMATION SECURITY

II YEAR I SEMESTER

S. No.	Subject Code	SUBJECT	L	T	P	Total Marks(100)		Credits
						Int	Ext	
1.	CN3E10	**Elective-5:**	3	-	-	40	60	3
	CN3E11	Blockchain Technology						
	CN3E12	TCP/IP Protocol Suite						
	CN3E13	Intrusion Detection and Prevention Systems						
	CN3E14	Network Design						
	CN3E15	Cloud Security						
2.	CN3O10	**Open Elective-1:**	3	-	-	40	60	3
	CN3O11	Image Processing and Pattern Recognition						
	CN3O12	Network Programming						
	CN3O13	Biometrics						
	CN3O14	Cyber Security						
	CN3O15	Natural Language Processing						
	CN3O16	Computer Vision						
	CN3O17	Cyber Laws and Ethics						
3.	CN3P10	**Project Work:** Project Phase-1	-	-	20	40	60	10
		TOTAL	6	-	20			16

II YEAR II SEMESTER

S. No.	Subject Code	SUBJECT	L	T	P	Total Marks(100)		Credits
						Int	Ext	
1.	CN4P10	**Project Work:** Project Phase-2	-	-	32	-	100	16
		TOTAL	-	-	32			16

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1C10

DATA STRUCTURES AND ALGORITHMS
(CORE – 1)

Objectives:

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.
- Significance of algorithms in the computer field
- Various aspects of algorithm development
- Qualities of a good solution

UNIT I

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples.
Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

UNIT III

Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.
Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-dfs and bfs, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

UNIT V

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees.
Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3rd edition, Cengage Learning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

REFERENCES:

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8th editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3rd edition, Wiley.
5. Data structures and the Java Collection Frame work,W.J.Collins, Mc Graw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain, J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1C20

PRINCIPLES OF INFORMATION SECURITY
(CORE – 2)

Objectives:

- To introduce the concepts of Information Security
- To understand the concepts of cryptography
- To understand the various encryption algorithms
- To understand various authentication algorithms

UNIT – I

Information Security: Introduction, History of Information security, What is Security, CNSS Security Model, Components of Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Security Systems Development Life Cycle.

UNIT – II

Introduction to the Concepts of Security: Introduction, The Need for Security, Security Apporaches, Principles of Security, Types of Attacks, **Cryptopgraphy Techniques:** Symmetric and Asymmetric Key Cryptography, Steganography **Symmetric Key Algorithms:** Data Encrption Standard(DES), International Data Encryption Algorithm(IDEA), RC4, RC5, Blowfish, Advanced Encrption Standard(AES), Key Management, **Asymmetric key Algorithms: Overview of A**symmetric Key Cryptography, RSA Algorithm, ElGamal Cryptography, Diffie-Hellman Key Exchange, Key Management

UNIT – III

Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Funtions, **MAC Algorithms**: Secure Hash Algorithm, Whirlpool, HMAC, Digital signatures, X.509, Kerberos

UNIT – IV

Security at layers(Network, Transport, Application): IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME

UNIT – V

Intruders, Virus: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, **Case Studies on Cryptography and security:** Single Sign On(SSO), Secure Inter-branch Payment Transactions, Secret Splitting, Secure Multiparty Calculation.

TEXT BOOKS:

1. Principles of Information Security: Michael E. Whitman, Herbert J. Mattord, CENGAGE Learning, 5th Edition.
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 3rd Edition

3. Cryptography and Network Security : William Stallings, Pearson Education,6th Edition

REFERENCES:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning
3. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2nd Edition
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1C30

COMPUTER NETWORKING
(CORE – 3)

Objectives:

- The objective of this course is to build a solid foundation in computer networks concepts and design
- To understand computer network architectures, protocols, and interfaces.
- The OSI reference model and the Internet architecture network applications.
- The course will expose students to the concepts of traditional as well as modern day computer networks - wireless and mobile, multimedia-based.
- Students completing this course will understand the key concepts and practices employed in modern computer networking

UNIT –I

Computer Networks and the Internet: What Is the Internet?, The Network Edge , The Network Core , Delay, Loss, and Throughput in Packet-Switched Networks , Protocol Layers and Their Service Models, Networks Under Attack

Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service

UNIT – II

Transport Layer: Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.

UNIT-III

The Network Layer: Introduction, Virtual Circuit and Datagram Networks, What's Inside a Router?, The Internet Protocol (IP): Forwarding and Addressing in the Internet , Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing.

UNIT – IV

The Link Layer: Links, Access Networks, and LANs, Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking,

UNIT – V

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs, Cellular Internet Access, **Mobility Management**: Principles, Mobile IP, Managing Mobility in Cellular Networks, **Wireless and Mobility**: Impact on Higher-Layer Protocols.

TEXT BOOKS:

1. Computer Networking: A Top Down Approach , *James F. Kurose, Keith W.Ross,* 6th Edition.
2. Data Communications and Networking, *Behrouz A. Forouzan,* Fourth Edition, Tata McGraw Hill
3. High Speed Networks and Internets – Performance and Quality of Service, *William Stallings,* Second Edition, Pearson Education.
4. Top-Down Network Design, *Priscilla Oppenheimer,* Second Edition, Pearson Education (CISCO Press)

REFERENCES:

1. Computer Networks by Mayank Dave, Cengage.
2. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson,* Fifth Edition, Thomson.
3. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.
4. An Engineering Approach to Computer Networking, *S.Keshav,* Pearson Education.
5. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet,* Pearson Education (CISCO Press)
6 Computer Communications Networks, Mir, Pearson Education.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E11 INTERNET OF THINGS
(ELECTIVE – 1)

Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the hardware and working principles of various sensors used for IoT
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

UNIT I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT II

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT III

IoT Physical Devices and Endpoints - Introduction to Raspberry Pi- Installation, Interfaces (serial, SPI, I2C)**,**Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

Unit IV

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, Using unipolar and bipolar Stepper motors
Digital input- Sensing push switch, pull-up and pull-down resistors, Rotary encoder, Using keypad, Using RTC
Sensors: Light sensor, temperature sensor with thermistor, voltage sensor, ADC and ADC, Temperature and Humidity Sensor DHT11, Read Switch, Distance Measurement with ultrasound sensor

UNIT V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOK:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN1E12

MOBILE APPLICATION DEVELOPMENT
(ELECTIVE – 1)

Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To demonstrate their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

UNIT I

Introduction to Android Operating System:

Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – droid Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application ifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT II

Android User Interface:

Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT III

Intents and Broadcasts:

Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT IV

Persistent Storage:

Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

UNIT V

Advanced Topics: Alarms – Creating and using alarms

Using Internet Resources – Connecting to internet resource, using download manager

Location Based Services – Finding Current Location and showing location on the Map, updating location

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCES:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

MASTER OF TECHNOLOGY

(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E13

DATA MINING
(ELECTIVE – 1)

Objectives:

- To understand data mining concepts.
- To learn about various data preprocessing techniques.
- To learn about data warehousing.
- To learn about various data mining functionalities such as association rule mining, clustering, classification and outlier analysis.

UNIT I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Usage of Data Warehousing Online Analytical Processing and Mining

Data Cube Computation: Efficient Methods for simple Data Cube Computation (Full Cube, Iceberg Cube, Closed Cube and Shell Cube), Discovery Driven exploration of data cubes, Attribute-Oriented Induction for data characterization and its implementation

UNIT III

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, The Apriori algorithm for finding frequent itemsets using candidate generation, Generating association rules from frequent itemsets, Mining frequent itemsets without candidate generation, Mining various kinds of Association Rules, Correlation Analysis

UNIT IV

Classification and Prediction: Description and comparison of classification and prediction, preparing data for Classification and Prediction

Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation

Prediction, linear and non-linear regression, evaluating accuracy of a Classifier or a Predictor

UNIT V

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, k-means and k-mediods methods, CLARANS, Agglomerative and divisive hierarchical

clustering, chameleon dynamic modeling, DBSCAN, Grid based clustering method: STING, Conceptual Clustering, Constraint-Based Cluster Analysis, Outlier Analysis.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - Jiawei Han, Micheline Kamber and Jian Pei,3rd edition, Morgan Kaufmann Publishers, ELSEVIER.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

REFERENCES:

1. Data Warehousing in the Real World – Sam Aanhory & Dennis Murray Pearson Edn Asia.
2. Insight into Data Mining,K.P.Soman,S.Diwakar,V.Ajay,PHI,2008.
3. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley student Edition
4. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley student edition
5. Building the Data Warehouse By William H Inmon, John Wiley & Sons Inc, 2005.
6. Data Mining Introductory and advanced topics –Margaret H Dunham, Pearson education
7. Data Mining Techniques – Arun K Pujari,2nd edition, Universities Press.
8. Data Mining,V.Pudi and P.Radha Krishna,Oxford University Press.
9. Data Mining:Methods and Techniques,A.B.M Shawkat Ali and S.A.Wasimi,Cengage Learning.
10. Data Warehouse 2.0,The Architecture for the next generation of Data Warehousing, W.H.Inmon,D.Strauss,G.Neushloss,Elsevier,Distributed by SPD.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E14 INTERNET TECHNOLOGIES AND SERVICES
(ELECTIVE – 1)

Objective:

The student who has knowledge of programming with java should be able to develop web based solutions using multi-tier architecture. S/he should have good understanding of different technologies on client and server side components as Follows:

Client Side: HTML5, CSS3, Javascript, Ajax, JQuery and JSON
Server Side: Servlets, JSP
Database: MySQL with Hibernate and Connection Pooling
Framework: Struts with validation framework, Internationalization (I18N)
SOA: Service Oriented Architecture, Web services fundamentals, Axis framework for WS

UNIT I
Client Side Technologies:
Overview of HTML - Common tags, XHTML, capabilities of HTML5
Cascading Style sheets, CSS3 enhancements, linking to HTML Pages, Classes in CSS
Introduction to JavaScripts, variables, arrays, methods and string manipulation, BOM/DOM (Browser/Document Object Model), accessing elements by ID, Objects in JavaScript
Dynamic HTML with JavaScript and with CSS, form validation with JavaScript, Handling Timer Events
Simplifying scripting with JQuery, JASON for Information exchange.

UNIT II
Introduction to Java Servlets:
Introduction to Servlets: Lifecycle of a Servlet, Reading request and initialization parameters, Writing output to response, MIME types in response, Session Tracking: Using Cookies and Sessions
Steps involved in Deploying an application
Database Access with JDBC and Connection Pooling
Introduction to XML, XML Parsing with DOM and SAX Parsers in Java
Ajax - Ajax programming with JSP/Servlets, creating XML Http Object for various browsers, Sending request, Processing response data and displaying it.
Introduction to Hibernate

UNIT III
Introduction to JSP:
JSP Application Development: Types of JSP Constructs (Directives, Declarations, Expressions, Code Snippets), Generating Dynamic Content, Exception Handling, Implicit JSP Objects,

Conditional Processing, Sharing Data Between JSP pages, Sharing Session and Application Data, Using user defined classes with jsp:useBean tag, Accessing a Database from a JSP.

UNIT IV

Introduction to Struts Framework:

Introduction to MVC architecture, Anatomy of a simple struts2 application, struts configuration file, Presentation layer with JSP, JSP bean, html and logic tag libraries, Struts Controller class, Using form data in Actions, Page Forwarding, validation frame work, Internationalization

UNIT V

Service Oriented Architecture and Web Services

Overview of Service Oriented Architecture – SOA concepts, Key Service Characteristics, Technical Benefits of a SOA

Introduction to Web Services– The definition of web services, basic operational model of web services, basic steps of implementing web services.

Core fundamentals of SOAP – SOAP Message Structure, SOAP encoding, SOAP message exchange models,

Describing Web Services –Web Services life cycle, anatomy of WSDL

Introduction to Axis– Installing axis web service framework, deploying a java web service on axis.

Web Services Interoperability **–** Creating java and .Net client applications for an Axis Web Service

(Note: The Reference Platform for the course will be open source products Apache Tomcat Application Server, MySQL database, Hibernate and Axis)

TEXT BOOKS:

1. Web Programming, building internet applications, Chris Bates 3rd edition, WILEY Dreamtech .
2. The complete Reference Java 7th Edition , Herbert Schildt., TMH.
3. Java Server Pages,Hans Bergsten, SPD, O'Reilly.
4. Professional Jakarta Struts - James Goodwill, Richard Hightower, Wrox Publishers.
5. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, rp – 2008.
6. Understanding SOA with Web Services, Eric Newcomer and Greg Lomow, Pearson Edition – 2009
7. Java Web Service Architecture, James McGovern, Sameer Tyagi et al., Elsevier – 2009

REFERENCES:

1. Programming the world wide web,4th edition,R.W.Sebesta,Pearson
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES , Marty Hall and Larry Brown Pearson
3. Internet and World Wide Web – How to program , Dietel and Nieto PHI/Pearson.
4. Jakarta Struts Cookbook , Bill Siggelkow, S P D O'Reilly.
5. Professional Java Server Programming,S.Allamaraju & othersApress(dreamtech).
6. Java Server Programming ,Ivan Bayross and others,The X Team,SPD
7. Web Warrior Guide to Web Programmming-Bai/Ekedaw-Cengage Learning.
8. Beginning Web Programming-Jon Duckett ,WROX.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E15

ADVANCED PROGRAMMING
(ELECTIVE - 1)

Unit I

Basic features of Python-Interactive execution,comments,types,variables,operators,expressions, Statements-assignment, input,print,Control flow-Conditionals,Loops,break statement,continue statement, pass statement,Functions,definition,call,scope and lifetime of variables,keyword arguments,default parameter values,variable length arguments,recursive functions,Functional programming-mapping,filtering and reduction,Lambda functions,Scope,namespaces and modules-import statement,creating own modules,avoiding namespace collisions when importing modules, module reload, LEBG rule, dir( ) function, iterators and generators, Sequences-Strings ,Lists and Tuples-basic operations and functions, iterating over sequences, List comprehensions, Packing and Unpacking of Sequences,Sets and Dictionaries- operations, regular expressions, Python program examples.

Unit II

Files-operations-opening, reading, writing, closing,file positions,file names and paths,functions for accessing and manipulating files and directories on disk, os module, Exceptions – raising and handling exceptions, try/except statements, finally clause, standard exceptions, Object oriented programming- classes, constructors, objects, class variables, class methods, static methods, Inheritance-is-a relationship, composition, polymorphism, overriding, multiple inheritance, abstact classes, multithreaded programming, time and calendar modules,Python program examples.

Unit III

GUI Programming with Tkinter , Widgets(Buttons, Canvas, Frame, Label, Menu, Entry, Text, Scrollbar, Combobox, Listbox, Scale),event driven programming-events, callbacks, binding, layout management-geometry managers:pack and grid, creating GUI based applications in Python.

Unit IV

Network Programming-Sockets, Socket addresses, Connection-oriented and Connectionless Sockets,socket module,urllib module,Socket object methods,Client/Server applications(TCP/IP and UDP/IP),Socketserver module, handling multiple clients, Client side scripting-Transferring files-FTP, ftplib module,ftplib.FTP class methods, sending and receiving emails- smtplib module, smtplib.SMTP class methods, poplib module, poplib.POP3 methods, Python program examples.

Unit V

Database Programming-SQL Databases,SQLite,sqlite3 module, connect function( ),DB-API 2.0 Connection object methods, Cursor object Attributes and methods, creating Database applications in Python, Web programming-Simple web client, urllib, urlparse modules,
Server side scripting-Building CGI applications-Setting up a web server, Creating the form page, Generating the results page, Saving state information in CGI Scripts, HTTP Cookies,
Creating a cookie, Using cookies in CGI scripts, Handling cookies with urllib2 module,
cgi module.

TEXT BOOKS :

1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.
2. Core Python Programming, 2nd edition, W.J.Chun, Pearson.
3. Python Programming, R.Thareja, Oxford University Press.
4. Programming Python, 3rd edition, Mark Lutz, SPD,O'Reilly.

REFERENCE BOOKS :

1. Introduction to Computer Science using Python, Charles Dierbach, Wiley India Edition.
2. Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
3. Beginning Python,2nd edition, Magnus Lie Hetland, Apress, dreamtech press.
4. Starting out with Python, 3rd edition, Tony Gaddis, Pearson.
5. Python Essential Reference, D.M.Beazley, 3rd edition, Pearson.
6. Programming in Python3, Mark Summerfield, Pearson.
7. Think Python, How to think like a computer scientist, Allen B. Downey,SPD, O'Reilly.
8. www.python.org web site.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E21

DISTRIBUTED SYSTEMS
(ELECTIVE –2)

Objectives:

- To explain what a distributed system is, why you would design a system as a distributed system, and what the desired properties of such systems are;
- To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions;
- To recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems;
- To design a distributed system that fulfils requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognize when this is not possible, and explain why;
- To build distributed system software using basic OS mechanisms as well as higher-level middleware and languages.

UNIT-I

Characterization of Distributed Systems. Design Issues, User Requirement, Network Technologies and Protocols, IPC, Client-Server Communication, Group Communication, IPC in UNIX.
Remote Procedure Calling, Design issues, Implementation, Asynchronous RPC

UNIT-II

Distributed OS, Its kernel, Processes and Threads, Naming and Protection, Communication and Invocation, Virtual Memory, File Service components, Design issues, Interfaces, implementation techniques, SUN network file systems

UNIT-III

SNS – a name service model, its design issues, Synchronizing physical clocks, Logical time and logical clocks, Distributed coordination. Replication and its architectural model, Consistency and request ordering, Conversation between a client and a server, Transactions, Nested Transactions.

UNIT-IV

Concurrency control Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions and Nested Transactions, Atomic commit protocols, Concurrency control in distributed transactions, distributed Deadlocks, Transactions with replicated data, Transaction recovery, Fault tolerance, Hierarchical and group masking of faults.

UNIT-V

Cryptography, Authentication and key distribution, Logics of Authentication, Digital signatures. Distributed shared memory, Design and Implementation issues, Sequential consistency and ivy, Release consistency and Munin, Overview of Distributed Operating systems Mach, Chorus.

TEXT BOOKS:

1. G Coulouris, J Dollimore and T Kindberg - Distributed Systems Concepts and Design, Third Edition, Pearson Education.

REFERENCES:

1. M Singhal, N G Shivarathri - Advanced Concepts in Operating Systems, Tata McGraw Hill Edition.
2. A.S. Tanenbaum and M.V. Steen - Distributed Systems – Principles and Paradigms, Pearson education.

MASTER OF TECHNOLOGY

(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E22

DATABASE SYSTEMS
(ELECTIVE – 2)

Objectives:

- By the end of the course, you will know:
- History and Structure of databases
- How to design a database
- How to convert the design into the appropriate tables
- Handling Keys appropriately
- Enforcing Integrity Constraints to keep the database consistent
- Querying relational data ,Triggers, Procedures and Cursors
- Normalizing the tables to eliminate redundancies
- Transaction Management
- Storage Optimizing Strategies for easy retrieval of data through index
- Processing the queries

UNIT I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL,DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER diagrams,. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views –Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers

UNIT II

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms – BCNF –Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT III

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques – Concurrency Control without Locking.

Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery .

UNIT IV

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes and Performance Tuning

Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.

Disk Space Management, Buffer Manager, Files of Records, Page Formats, Record Formats Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM)

B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable Vs Linear Hashing.

UNIT V

Overview Of Query Evaluation: The System Catalog, Introduction to Operator Evaluation, Algorithms for Relational Operations, Introduction to Query Optimization, Alternative Plans: A Motivating Example, What a Typical Optimizer Does?

Evaluating Relational Operators: The' Selection Operation, General Selection Conditions, The Projection Operation, The Join Operation, The Set Operations, Aggregate Operations, The Impact of Buffering.

A Typical Relational Query Optimizer: Translating SQL Queries into Algebra, Estimating the Cost of a Plan, Relational Algebra Equivalences, Enumeration of Alternative Plans, Nested Subqueries, The System R Optimizer, Other Approaches to Query Optimization.

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition
2. Database Systems: The Complete Book, Hector Garcia-Molina, Jeffrey Ullman, Jennifer Widom

REFERENCES:

1. Database Systems implementation Hector Garcia-Molina, Jeffrey Ullman, Jennifer Widom
2. Introduction to Database Systems, C.J.Date, Pearson Education.
3. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition
4. Fundamentals of Database Systems , Ramez Elmasri, Shamkant B.Navathe, Pearson Education,
5. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1E23

INFORMATION RETRIEVAL SYSTEMS
(ELECTIVE – 2)

UNIT I

Introduction to Information Retrieval Systems : Definition of Information Retrieval System, Objectives of Information Retrieval System, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses;
Boolean retrieval. The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression.

UNIT II

Scoring, term weighting and the vector space model. Computing scores in a complete search system. Evaluation in information retrieval. Relevance feedback and query expansion.

UNIT III

XML retrieval. Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification.

UNIT IV

Support vector machines and machine learning on documents. Flat clustering. Hierarchical clustering. Matrix decompositions and latent semantic indexing.

UNIT V

Web search basics. Web crawling and indexes. Link analysis.

TEXT BOOKS:

1. Introduction to Information Retrieval , Christopher D. Manning and Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T Maybury,Springer.

REFERENCS :

1. Modern Information Retrival , Ricardo Baeza-Yates, Pearson Education, 2007.
2. Information Retrieval: Algorithms and Heuristics, David A Grossman and Ophir Frieder, 2nd Edition, Springer, 2004.
3. Information Retrieval Data Structures and Algorithms, William B Frakes, Ricardo Baeza- Yates, Pearson Education, 1992.
4. Information Storage & Retieval , Robert Korfhage , John Wiley & Sons.

MASTER OF TECHNOLOGY
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CN1E24

ARTIFICIAL INTELLIGENCE
(ELECTIVE-2)

Objectives:

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

UNIT-I

Introduction: What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies

UNIT-II

Knowledge and Reasoning: Knowledge-based Agents, Representation, Reasoning and Logic, Prepositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT-III

Learning: Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks

UNIT-IV

Practical Natural Language Processing: Practical applications, Efficient parsing, Scaling up the lexicon, Scaling up the Grammar, Ambiguity, Perception, Image formation, Image processing operations for Early vision, Speech recognition and Speech Synthesis

UNIT-V

Robotics: Introduction, Tasks, parts, effectors, Sensors, Architectures, Configuration spaces, Navigation and motion planning, Introduction to AI based programming Tools

TEXT BOOKS

1. Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach",2nd Edition, Pearson Education, 2007

REFERENCES

1. Artificial Neural Networks B. Yagna Narayana, PHI

2. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).

3. Artificial Intelligence and Expert Systems – Patterson PHI.

4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.

5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.

6. Neural Networks Simon Haykin PHI

MASTER OF TECHNOLOGY
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CN1E25

SOFTWARE ENGINEERING
(ELECTIVE –2)

Objectives:

Your studies will enable you to develop:

- a broad and critical understanding of all the processes for engineering high quality software and the principles, concepts and techniques associated with software development
- an ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems
- a range of skills focused on the analysis of requirements, design and implementation of reliable and maintainable software, with strong emphasis on engineering principles applied over the whole development lifecycle
- an awareness of current research in software development, the analytical skills and research techniques for their critical and independent evaluation and their application to new problems.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software myths.**A Generic view of process:** Software engineering - A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.**Process models:** The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process.

UNIT II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT III

Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design.**Creating an architectural design:** software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow into a software architecture.**Modeling component-level design:** Designing class-based components, conducting component-level design, Object constraint language, designing conventional components.Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.**Product metrics:** Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. **Metrics for Process and Products**: Software Measurement, Metrics for software quality.

UNIT V

Risk management: Reactive vs Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.**Quality Management**: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.**Configuration Management:** Configuration Management planning, Change management, Version and release management, System building, CASE tools for configuration management.

TEXT BOOKS:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, sixth edition. McGraw Hill International Edition, 2005
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education, 2004.

REFERENCE BOOKS:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. Fundamentals of Software Engineering, Rajib Mall,PHI, 2005
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.
7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications, 2008.
8. Software Engineering 3: Domains, Requirements and Software Design, D.Bjorner, Springer, International Edition.
9. Software Engineering Principles and Practice, Hans Van Vliet,3rd edition, Wiley India edition.
10. Introduction to Software Engineering, R.J.Leach,CRC Press.
11. Software Engineering Fundamentals, Ali Behforooz and Frederick J.Hudson, Oxford University Press, rp2009
12. Software Engineering Handbook, Jessica Keyes, Auerbach, 2003.

MASTER OF TECHNOLOGY
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I YEAR I SEMESTER

CN1L10

DATA STRUCTURES AND ALGORITHMS THROUGH JAVA LAB
(LAB – 1)

Sample Problems on Data structures:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   a) Linear search b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
   a) List ADT
3. Write Java programs to implement the following using an array.
   a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
   a) Stack ADT b)Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
   a) Array b) Singly linked list c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
    a) Construct a binary search tree of elements.
    b) Search for a key element in the above binary search tree.
    c) Delete an element from the above binary search tree.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Javaprogram to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
    a) Preorder b) Inorder and c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
    a) Bubble sort d) Merge sort g) Binary tree sort
    b) Insertion sort e) Heap sort
    c) Quick sort f) Radix sort
16. Write a Java program to perform the following operations:

a) Insertion into a B-tree b) Searching in a B-tree

17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

REFERENCES:

1. Data Structures and Algorithms in java,3rd edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard,2nd edition, Schaum's Outlines,TMH.
3. Data Structures and algorithms in Java, 2nd Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P.H.Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work,W.J.Collins,Mc Graw Hill.
8. Java: the complete reference, 7th editon, Herbert Schildt, TMH.
9. Java for Programmers,P.J.Deitel and H.M.Deitel,Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel ,8th edition,PHI.
10. Java Programming,D.S.Malik,Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

(Note: Use packages like java.io, java.util, etc)

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CN1L21

INTERNET OF THINGS LAB
(ELECTIVE-2 LAB)
(LAB – 2)

Python Basic exercises

1. Write a Python program that reads 10 integers from keyboard and prints the average of even numbers and odd numbers separately

2. Write a Python program that prints the grade of a student when internal and external marks are given. A candidate is declared Failed (Grade = F), if Total marks < 50 or External marks < 25.

If a candidate is passed, then Grade is given as follows:

Condition	**Grade**
50 <= total marks < 60	E
60 <= total marks < 70	D
70 <= total marks < 80	C
80 <= total marks < 90	B
total marks >= 70	A

3. Create a table in MySQL that stores the status of devices in a house with the following data (Device ID, Device Name and Device State, last altered date and time). Now write a Python program that reads and alters the state of a given device. The date format is "YYYY-MM-DD:HH-mm-ss" where mm is minutes and ss is seconds.

4. Write a Python program that loads all the states of the devices into a dictionary from the table mentioned above.

5. Write a Python program that sorts the device states based on the last altered time

6. Write a Python program that reads a string from keyboard and prints the count of each alphabet in the string.

7. Write a Python program that reads a page from internet and prints it on the screen.

8. Write a Python program that reads and modifies an XML file

9. Write a Python program that reads and alters JSON data from a database table

10. Write a client-server Python program that uses socket connection to implement a time server. The client will connect to the server and the server sends the current time as "YYYY-MM-DD:HH-mm-ss" format. This value should be printed on the client side.

11. Write a Python program that generates 10 random numbers and stores them in a text file one per line. Now write another Python program that reads this data into a list and shows them

12. Write a program that reads key-value pair data from a file and stores them in a database table

13. Write a Python program that reads a time string in the format of "YYYY-MM-DD:HH-mm-ss" and prints its components separately.

14. Write a Python program that reads data from a table and writes it to a text file using tab as field separator and new line as record separator and vice versa.

Raspberry Pi Experiments:

Use Raspberry Pi for all the experiments

1. Connect an LED to GPIO pin 25 and control it through command line

2. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch. The state of LED should toggle with every press of the switch

3. Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds

4. Use joystick and display the direction on the screen

5. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light.

6. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.

7. User rotary encoder and print the position of the shaft on the console

8. Control a servo motor angle that is taken from the keyboard

9. Switch on and switch of a DC motor based on the position of a switch

10. Convert an analog voltage to digital value and show it on the screen.

11. Create a door lock application using a reed switch and magnet and give a beep when the door is opened.

12. Control a 230V device (Bulb) with Raspberry Pi using a relay

13. Control a 230V device using a threshold temperature, using temperature sensor.

14. Simulate an earthquake alarm using vibration sensor and give an alarm when vibration is detected.

15. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).
16. Create a web application for the above applications wherever possible with suitable modifications to get input and to send output.

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CN1L22

MOBILE APPLICATION DEVELOPMENT LAB
(ELECTIVE-1 LAB)
(LAB-2)

Objectives:

To learn how to develop user interface applications.

To learn how to develop URL related applications.

The student is expected to be able to do the following problems, though not limited.

1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.

3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

7. Create a user registration application that stores the user details in a database table.

8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the

user should be verified with the database and an appropriate dialog should be shown to the user.

9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.

10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.

11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.

12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

13. Create an application that shows the given URL (from a text field) in a browser.

14. Develop an application that shows the current location's latitude and longitude continuously as the device is moving (tracking).

15. Create an application that shows the current location on Google maps.

Note:

Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component.

The student should pay attention to the properties of each components, which are used later in Android programming. Following are useful links:

1. http://ai2.appinventor.mit.edu

2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

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CN1L23

DATA MINING LAB
(ELECTIVE-1 LAB)
(LAB – 2)

List of Sample Problems:

Task 1: Credit Risk Assessment

Description:

The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.
1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data:
Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spreadsheet version of the German credit data.
In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !)

A few notes on the German dataset
• DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter).
• owns_telephone. German phone rates are much higher than in Canada so fewer people own telephones.
• foreign_worker. There are millions of these in Germany (many from Turrkey). It is very hard to

get German citizenship if you were not born of German parents.
• There are 20 attributes used in judging a loan applicant. The goal is the classify the applicant into one of two categories, good or bad.

Subtasks : (Turn in your answers to the following tasks)

1.List all the categorical (or nominal) attributes and the real-valued attributes seperately. (5 marks)

2.What attributes do you think might be crucial in making the credit assessment ? Come up with some simple rules in plain English using your selected attributes. (5 marks)

3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training. (10 marks)

4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly ? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy ? (10 marks)

5. Is testing on the training set as you did above a good idea ? Why orWhy not ? (10 marks)

6. One approach for solving the problem encountered in the previous question is using cross-validation ? Describe what is cross-validation briefly. Train a Decistion Tree again using cross-validation and report your results. Does your accuracy increase/decrease ? Why ? (10 marks)

7. Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss. (10 marks)

8. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.) (10 marks)

9. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifcations equally in both cases, give a higher cost to the first case

(say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)? (10 marks)

10. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees ? How does the complexity of a Decision Tree relate to the bias of the model ? (10 marks)

11. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain ? Also, report your accuracy using the pruned model. Does your accuracy increase ? (10 marks)

12. (Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules.PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR. (10 marks)

Task Resources:

- Mentor lecture on Decision Trees
- Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)
- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)
- Weka resources:
    - Introduction to Weka (html version) (download ppt version)
    - Download Weka
    - Weka Tutorial
    - ARFF format
    - Using Weka from command line

Task 2: Hospital Management System

Data Warehouse consists Dimension Table and Fact Table.

REMEMBER The following

Dimension

The dimension object (Dimension):

_ Name
_ Attributes (Levels) , with one primary key
_ Hierarchies

One time dimension is must.

About Levels and Hierarchies

Dimension objects (dimension) consist of a set of levels and a set of hierarchies defined over those levels. The levels represent levels of aggregation. Hierarchies describe parent-child relationships among a set of levels.

For example, a typical calendar dimension could contain five levels. Two hierarchies can be defined on these levels:

H1: YearL > QuarterL > MonthL > WeekL > DayL
H2: YearL > WeekL > DayL

The hierarchies are described from parent to child, so that Year is the parent of Quarter, Quarter the parent of Month, and so forth.

About Unique Key Constraints

When you create a definition for a hierarchy, Warehouse Builder creates an identifier key for each level of the hierarchy and a unique key constraint on the lowest level (Base Level)
Design a Hospital Management system data warehouse (TARGET) consists of Dimensions Patient, Medicine, Supplier, Time. Where measures are ' NO UNITS', UNIT PRICE.
Assume the Relational database (SOURCE) table schemas as follows
TIME (day, month, year),
PATIENT (patient_name, Age, Address, etc.,)
MEDICINE (Medicine_Brand_name, Drug_name, Supplier, no_units, Uinit_Price, etc.,)
SUPPLIER :(Supplier_name, Medicine_Brand_name, Address, etc.,)
If each Dimension has 6 levels, decide the levels and hierarchies, Assume the level names suitably.
Design the Hospital Management system data warehouse using all schemas. Give the example 4-D cube with assumption names.

Similar Tasks Can Be Framed

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INTERNET TECHNOLOGIES AND SERVICES LAB
(ELECTIVE-1 LAB)
(LAB – 2)

Objectives:

- Write syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields
- Discuss differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute
- Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address
- Install a web server and perform basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log
- Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms
- Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements
- Demonstrate techniques for improving the accessibility of an HTML document

List of Sample Problems:

I. Internet Technologies

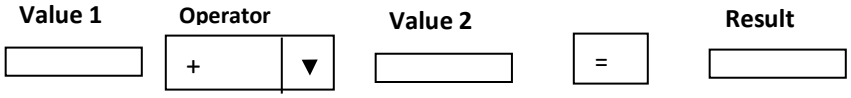
1. Develop static pages (using Only HTML) of an online Book store. The pages should resemble: www.amazon.com the website should consist the following pages.
   Home page, Registration and user Login
   User Profile Page, Books catalog
   Shopping Cart, Payment By credit card
   Order Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
3. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
4. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using Servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
5. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

6. Implement the "Hello World!" program using JSP Struts Framework.

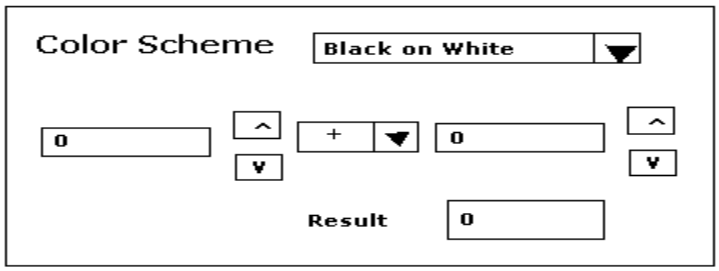
Additional Assignment Problems

1. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.
2. Write a java swing application that takes a text file name as input and counts the characters, words and lines in the file. Words are separated with white space characters and lines are separated with new line character.
3. Write a simple calculator servlet that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or PostgreSQL
4. Write an HTML page that contains a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
5. Write a servlet that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

6. Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, * and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably. The screen may look similar to the following:

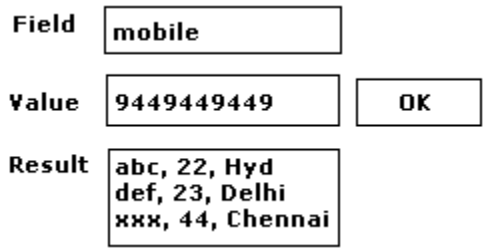


7. Write a Java program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:



The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and * (selectable). Once any change takes place, the result must be automatically computed by the program.

8. Write a Java Application that will read an XML file that contains personal information (Name, Mobile Number, age and place. It reads the information using SAX parser. After reading the information, it shows two input Text Fields in a window, one for tag name and the other for value. Once these two values are given, it should list all the records in the XML file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD"? An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.



9. Consider the following web application for implementation:
The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.
If name and password matches, serves a welcome page with user's full name.
If name matches and password doesn't match, then serves "password mismatch" page
If name is not found in the database, serves a registration page, where users full name, present user name (used to login) and password are collected. Implement this application in:
    1. Pure JSP
    2. Pure Servlets
    3. Struts Framework

10. Implement a simple arithmetic calculator with +, -, /, *, % and = operations using Struts Framework The number of times the calculator is used should be displayed at the bottom (use session variable).

iii)Internet Technologies and Services Lab - Additional Problems

1. Create a web Service in Java that takes two city names from the user and returns the distance between these two from data available from a table in MySql.Write a java and a C# client which use the above service
2. Write a Java program that takes a file as input and encrypts it using DES encryption. The program should check if the file exists and its size is not zero.
3. Write a Java program that generates a key pair and encrypts a given file using RSA algorithm
4. Write a Java program that finds digest value of a given string
5. Consider the following xml file for encryption
<?xml version="1.0"> <transaction> <from>12345</from> <to>54321</to> <amount>10000</amount>
<secretcode>abc123</secretcode> <checksum></checksum> </transaction>
Replace <from> and <to> values with the RSA encrypted values represented with base64 encoding assuming that the public key is available in a file in local directory "pubkey.dat".

Encrypt <secretcode> with AES algorithm with a password 'secret'. The checksum of all the field values concatenated with a delimiter character '+' will be inserted in the checksum and the xml file is written to encrypted.xml file.

6. Assume that a file 'config.xml', which has the following information:
   <users>
   <user> <name>abc</name> <pwd>pwd123</pwd> <role>admin</role> <md5>xxx</md5> </user>
   <user> <name>def</name> <pwd>pwd123</pwd> <role>guest</role> <md5>xxx</md5> </user>
   </users>
   Replace name and role with DES encrypted values and pwd with RSA encrypted values (represent the values with base64 encoding). The public key is available in "public.key" file in current directory. Replace xxx with respective MD5 values of all the fields for each user. Write the resulting file back to config.xml.
7. Write an HTML page that gives 3 multiple choice (a,b,c and d) questions from a set of 5 preloaded questions randomly. After each question is answered change the color of the question to either green or blue using CSS. Finally on clicking OK button that is provided, the score should be displayed as a pop-up window. Use Java Script for dynamic content
8. Write an HTML page that has 3 countries on the left side ("USA", "UK" and "INDIA") and on the right side of each country, there is a pull-down menu that contains the following entries: ("Select Answer", "New Delhi", "Washington" and "London"). The user will match the Countries with their respective capitals by selecting an item from the menu. The user chooses all the three answers (whether right or wrong). Then colors of the countries should be changed either to green or to red depending on the answer. Use CSS for changing color
9. Write an HTML Page that can be used for registering the candidates for an entrance test. The fields are: name, age, qualifying examination (diploma or 10+2), stream in qualifying examination. If qualifying examination is "diploma", the stream can be "Electrical", "Mechanical" or "Civil". If the qualifying examination is 10+2, the stream can be "MPC" or "BPC". Validate the name to accept only characters and spaces.
10. Write an HTML page that has two selection menus. The first menu contains the states ("AP", "TN" and "KN") and depending on the selection the second menu should show the following items: "Hyderabad", "Vijayawada", "Kurnool" for AP, "Chennai", "Salem", "Madurai" for TN and "Bangalore", "Bellary", "Mysore" for KN.
11. Write an HTML page that has phone buttons 0 to 9 and a text box that shows the dialed number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If the number is not a valid international number (+ followed by country code and 10 digit phone number) the color of the display should be red and it should turn to green when the number is valid. Consider only "+91, +1 and +44 as valid country codes. Use CSS for defining colors.
12. Write an HTML page that has a text box for phone number or Name. If a number is entered in the box the name should be displayed next to the number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If a name is entered in the text box, it should show the number next to the name. If the corresponding value is not found, show it in red and show it in green otherwise. Use CSS for colors. Store at least 5 names and numbers in the script for testing

13. A library consists of 10 titles and each title has a given number of books initially. A student can take or return a book by entering his/her HTNo as user ID and a given password. If there are at least two books, the book is issued and the balance is modified accordingly.
    (a) Use RDBMS and implement it with JSP.
    (b) Use XML File for data and Implement it with JSP
    (c) Use RDBMS and implement it with Servlets
    (d) Use XML File for data and Implement it with Servlets
14. A Bus Reservation System contains the details of a bus seat plan for 40 seats in 2x2 per row arrangement, where the seats are numbered from 1 to 40 from first row to last row. The customer can visit the website and can reserve a ticket of his choice if available by entering his details (Name, Address, Gender and Age). The customer can cancel the ticket by entering the seat number and his name as entered for reservation.
    (a) Use RDBMS and implement it with JSP.
    (b) Use XML File for data and Implement it with JSP
    (c) Use RDBMS and implement it with Servlets
    (d) Use XML File for data and Implement it with Servlets
15. Implement a simple messaging system with the following details:
    When a student logs in with his/her HTNO and a given password, they should get all the messages posted to him/her giving the ID of sender and the actual message. Each message may be separated with a ruler. There should be a provision for the user to send a message to any number of users by giving the IDs separated with commas in the "To" text box.
    (a) Use RDBMS and implement it with JSP.
    (b) Use XML File for data and Implement it with JSP
    (c) Use RDBMS and implement it with Servlets
    (d) Use XML File for data and Implement it with Servlets.
16. There is an image of 600x100 size which can be logically divided into 12 button areas with labels (0-9, +, =). Write a javascript calculator program that uses this image as input virtual keyboard and three text areas for two input numbers and result of sum of these numbers. Add a CSS that can be used to change the colors of text and background of text areas and the page. The input numbers can be up to 4 digits each.
17. Develop a web application that takes user name and password as input and compares them with those available in an xml user database. If they match, it should display the welcome page that contains the user's full name and last used date and time retrieved from a client cookie. On logout it stores new time to the cookie and displays a goodbye page. If authentication fails, it should store the attempt number to the client cookie and displays an error page. Add necessary CSS that takes care of the font, color of foreground and background.
18. A web application has the following specifications:
    The first page (Login page) should have a login screen where the user gives the login name and password. Both fields must be validated on client side for a minimum length of 4 characters, name should be lower case a-z characters only and password should contain at least one digit. On submitting these values, the server should validate them with a MySQL database and if failed, show the login page along with a message saying "Login Name or Password Mismatch" in Red color below the main heading and above the form. If successful, show a welcome page with the user's full name (taken from database) and and a link to Logout. On logout, a good bye page is displayed with the total time of usage (Logout time – login time). Specify the Schema details of table and web.xml file contents.

Implement it using (a) JSP Pages (b) Servlets (c) Struts

19. Design a struts based web portal for an international conference with following specifications:

The welcome page should give the details of the conference and a link to login. If login fails, direct them back for re-login and also provide a link for registration. On successful registration/login, the user will be directed to a page where s/he can see the status (accepted/rejected) of their already submitted papers followed by a form for submitting a doc file to the conference. Provide a logout button on all pages including the home page, once the user logs in. Implement validation framework to check that the user name is in the form of CCDDCC and password is in the form of (CCSDDD) (C for character, S for special character (one of @, #, $, %, ^, & and !) and D for digit)., Database should be accessed through Connection Pool for MySql for user information. Provide scope for internationalization in future. Assume any missing information and mention it first.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1L25

ADVANCED PROGRAMMING LAB
(ELECTIVE-1 LAB)
(LAB – 2)

Note: The problems given below are only sample problems.

1. Write a Python program that reads a list of names and ages, then prints the list sorted by age.
2. Write a Python program that will prompt the user for a file name, read all the lines from the file into a list, sort the list, and then print the lines in sorted order.
3. Write a Python program that asks the user for a file name, and then prints the number of characters, words, and lines in the file.
4. Write a Python program that will prompt the user for a string and a file name, and then print all lines in the file that contain the string.
5. Create a class Rectangle. The constructor for this class should take two numeric arguments, which are the length and breadth. Add methods to compute the area and perimeter of the rectangle, as well as methods that simply return the length and breadth. Add a method isSquare that returns a Boolean value if the Rectangle is a Square.
6. Write a class Complex for performing arithmetic with complex numbers. The constructor for this class should take two floating-point values. Add methods for adding, subtracting, and multiplying two complex numbers.
7. Write a Python program that converts a fully parenthesized arithmetic expression from infix to postfix.
8. Write a Python program that reads a postfix expression from standard input, evaluates it, and writes the value to standard output.
9. Write a Python program that takes a command-line argument n and writes the number of primes less than or equal to n.

10.Write a Python program that implements binary search method to search for a key in a sorted list.

Sample problems covering data structures:

11.Write Python program to implement the List ADT using a linked list.

12.Write Python programs to implement the deque (double ended queue) ADT using

a) Array b) Singly linked list c) Doubly linked list.

13.Write a Python program to implement priority queue ADT.

14.Write a Python program to perform the following operations:

a) Construct a binary search tree of elements.

b) Search for a key element in the above binary search tree.

c) Delete an element from the above binary search tree.

15.Write a Python program to implement all the functions of a dictionary (ADT) using Hashing.

16.Write Python programs that use recursive and non-recursive functions to traverse the given binary tree in

a) Preorder b) Inorder c) Postorder.

17.Write Python programs for implementing the following sorting methods:

a) Merge sort

b) Insertion sort e) Heap sort

c) Quick sort f) Radix sort

18.Write a Python program that counts the occurrences of words in a text file and displays the words in decreasing order of their occurrence counts.

19.Write a Python program that prompts the user to enter a directory or a filename and displays its size.

20.Write a Python program that uses a recursive function to print all the permutations of a string.

21.Write a Python program that prompts the user to enter a directory and displays the number of files in the directory.

22.Suppose the password rules are as follows:

i)A password must have at least eight characters.

ii)A password must consist of only letters and digits.

iii)A password must contain atleast two digits.

Write a Python program that prompts the user to enter a password (string) and displays whether it is valid or invalid password.

23.Write a Python program to compute n! for large values of n.

24.In data compression, a set of strings is prefix-free if no string is a prefix of another. For example, the set of strings 01, 10, 0010, and 1111 is prefix-free, but the set of strings 01, 10, 0010, 1010 is not prefix-free because 10 is a prefix of 1010. Write a Python program that reads a set of strings from standard input and determines whether the set is prefix-free.

Sample problems covering Networking applications:

25.Write Echo Server and Client programs in Python.

26.Develop Echo Server in Python, one that can handle multiple clients in parallel using forking model on Unix platform.

27.Develop Echo Server in Python, one that can handle multiple clients in parallel using threading model on Unix and Microsoft windows platforms.

28.Develop Echo Server in Python, one that can handle multiple clients in parallel by multiplexing client connections and the main dispatcher with the select system call. Here a single event loop can process clients and accept new ones in parallel.

29.Implement in Python client and server-side logic to transfer an arbitrary file from server to client over a socket.

Sample problems covering GUI applications, Web applications and Database applications:

GUI applications:

1. Write a Python program that works as a simple calculator. Use a grid to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

2. Develop a Python GUI application that receives an integer in one text field, and computes its factorial Value and fills it in another text field, when the button named “Compute” is clicked.

3. Write a Python program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer Num2 is Zero, the program should Display an appropriate message in the result field in Red color.

4. Write a Python program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time.No light is on when the program starts.

Web Applications

1. Create a registration form with User name, Password and Aadhar Number. Validate the fields for correctness using JavaScript.
2. Create a database for registration and store the submitted values in the local database using serverside Python programs. If user name already exists, send back an error page.
3. Using cookies, display the user's last login time on the welcome page when the user logs into the website.

a) Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

b) Implement the same program in standalone GUI Program.

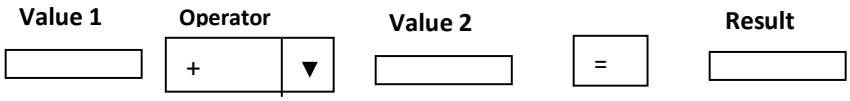
4. Write a Python GUI application that takes a text file name as input and counts the characters, words and lines in the file. Words are separated with white space characters and lines are separated with new line character.

5. Write a simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and sends the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or PostgreSQL.

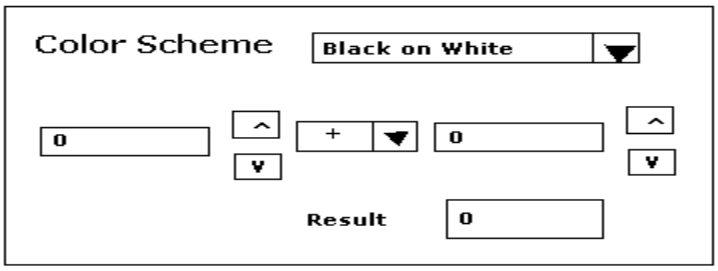
6. Write an HTML page that contains a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

7. Write a web Python application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

8. Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, * and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably. The screen may look similar to the following:

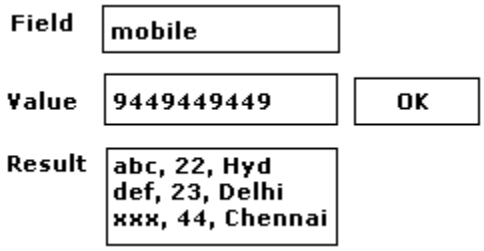


9. Write a Python program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:



The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and * (selectable). Once any change takes place, the result must be automatically computed by the program.

10. Write a Python Application that will read a text file that contains personal information (Name, Mobile Number, age and place (fields are separated by tabs and records are separated with new line). The first line contains the header with field names. After reading the information, it shows two input Text Fields in a window, one for name and the other for value. Once these two values are given, it should list all the records in the file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD". An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.



11.Consider the following web application for implementation:

The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.

a. If name and password matches, serves a welcome page with user's full name.

b. If name matches and password doesn't match, then serves “password mismatch” page

c. If name is not found in the database, serves a registration page, where users full name, present user name (used to login) and password are collected.

TEXT BOOKS :

1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.

2. Core Python Programming, 2nd edition, W.J.Chun, Pearson.

3. Core Python Application Programming, 3rd edition, W.J.Chun, Pearson.

4. Programming Python, 3rd edition, Mark Lutz, SPD,O’Reilly.

5. The Python 3 Standard Library by Example, Doug Hellmann, Pearson.

6. Introduction to Programming using Python, Y.Daniel Liang, Pearson.

7. Introduction to Programming in Python, R.Sedgewick, K. Wayne and R.Dondero, Pearson.

8. www.python.org web site.

9. Python Programming, R.Thareja, Oxford University Press.

10.Data structures and Algorithms using Python, Rance D.Necaise, Wiley Student edition.

11.Data structures and Algorithms in Python, M.T.Goodrich,R.Tamassia,M.H.Goldwasser,

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1A11

FOUNDATIONS OF COMPUTER SCIENCE
(AUDIT - 1)

Objectives

- To understand the fundamental concepts underlying OOP and apply them in solving problems.
- To learn to write programs in Java for solving problems.
- To understand the functions of Operating systems.
- To understand the Operating system services.
- To learn to use SQL to create, query and update the data in databases.

UNIT I

Java Basics - Java buzzwords, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, control flow-block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, Key attributes of Object Oriented Programming- Encapsulation, Inheritance, Polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, String handling-building strings, operating on strings, StringBuffer and StringBuilder, Enumerations, autoboxing and unboxing, Generics.

UNIT II

Inheritance – Inheritance concept, benefits of inheritance , Super classes and Sub classes, Member access rules, Inheritance hierarchies, super uses, preventing inheritance: final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods. **Interfaces** – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface. **Packages-**defining, creating and accessing a Package, understanding CLASSPATH, importing packages.

UNIT III

Exception handling – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, exception specification, built in exceptions, creating own exception sub classes. **Files** – streams- byte streams, character streams, text Input/output, binary input/output, random access file operations, file management using File class , java.io.

UNIT IV

Operating system Introduction- Operating system objectives and functions, Computer system organization, Computer system Architecture, Operating system structure, Operating system operations (Refer to Chapter 1 of 2nd text book).

Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments (Refer to Chapter 1 of 2nd text book).

Operating system structures-Operating system services, User and Operating system interface, System calls, types of System calls, System programs (Refer to Chapter 2 of 2nd text book).

UNIT V

MySQL(Database)- Introduction to SQL, Data types, Creating Database objects , Querying and Updating Data- Data Definition language (DDL) statements-CREATE,ALTER,DROP and Data Manipulation Language statements(DML)-SELECT,INSERT, UPDATE,DELETE((Refer to Chapter 4 and Chapter 5 of 3rd text book).

TEXT BOOKS :

1. Java: the complete reference, 10th edition, Herbert Schildt, Oracle Press, Mc-Graw Hill Education, Indian Edition.
2. Operating System Concepts, 9th edition, Abraham Silberschatz, P.B. Galvin, G. Gagne, Wiley Student Edition (Refer to Chapter 1 and Chapter 2 only), 2016 India edition.
3. Database Systems, 6th edition, R. Elamasri and S. B. Navathe, Pearson(Refer to Chapter 4 and Chapter 5 only)

REFERENCE BOOKS :

1. Java: How to Program P.Deitel and H.Deitel ,10th edition, Pearson.
2. Java Programming, D.S.Malik, Cengage Learning.
3. Core Java, Volume 1-Fundamentals, 9th edition, Cay S.Horstmann and Gary Cornell, Pearson.
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford Univ. Press.
5. Data base system concepts, A.Silberschatz, H.F. Korth and S.Sudarshan, Mc Graw Hill, VI th edition.
6. Introduction to SQL, Rick F. Van der Lans,4th edition, Pearson.
7. An introduction to programming and OO design using Java, J.Nino, F.A.Hosch, John Wiley&Sons.
8. Operating Systems – Internals and Design Principles, W. Stallings, Pearson.
9. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, Pearson.
10. Operating Systems A concept-based Approach, 3rd Edition, D.M. Dhamdhere, TMH.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1A12

PROFESSIONAL COMMUNICATION SKILLS
(AUDIT-1)

Course Objectives:

- To teach the four language skills - Listening, Speaking, Reading and Writing; critical thinking skills to students.
- To enable students comprehend the concept of communication.
- To help students cultivate the habit of Reading and develop their critical reading skills.

Course Outcomes:

- Students are trained to convert the conceptual understanding of communication into every day practice.
- Students are expected to be ready for placements.
- Students are prepared to communicate their ideas relevantly and coherently in professional writing.

UNIT I
INTRODUCTION

Basics of Communication - Principles of Communication - Types of Communication – Stages of Communication – Verbal and Non-verbal Communication – Channels of Communication – Barriers to Effective Communication – Formal and Informal Expressions in Various Situations.

UNIT II
READING & STUDY SKILLS

Reading Comprehension – Reading Strategies - Skimming and Scanning- Intensive and Extensive Reading– Unknown Passage for Comprehension - Critical Reading of Short Stories – Study Skills – Note Making – Summarizing – Articles and Prepositions – Synonyms and Antonyms

UNIT III
WRITING SKILLS

Difference between Spoken and Written Communication- Features of Effective Writing - Formation of a Sentence – SVOs and SVOC patterns – Types of sentences- Common errors in

Writing - Writing coherent sentences using connectives and conjunctions- Written Presentation Skills – Tenses – Concord – Question Tags - Practice Exercises - One Word Substitutes – Words Often Confused and Misspelt.

UNIT IV

PROFESSIONAL WRITING

Letter writing – Types, Parts and Styles of Formal Letters – Language to be used in Formal Letters – Letters of Enquiry, Complaint, and Apology with Replies – Letter of Application - Resume – E-mail – Active and Passive Voice.

UNIT V

REPORT WRITING

Types of Reports – Formats of Reports – Memo Format – Letter Format and Manuscript Format- Parts of Technical Report – Informational, Analytical and Project Reports – Idioms and Phrases.

REFERENCE BOOKS:

1. Meenakshi Raman & Sangeetha Sharma. 2012. *Technical Communication.* New Delhi
2. Rizvi, M. A. 2005. *Effective Technical Communication.* New Delhi: Tata McGraw Hill
3. Sanjay Kumar & Pushp Latha. 2012. *Communication Skills.* New Delhi: OUP
4. Er. A. K. Jain, Dr. Pravin S. R. Bhatia & Dr. A. M. Sheikh. 2013. *Professional Communication Skills*. S. Chand Publishers. New Delhi.
5. Farhathullah, T.M. 2009. *English for Business Communication.* Bangalore: Prism
6. Bikram K Das. 2011. Functional Grammar and Spoken and Written Communication in English. Kolkata: Orient Blackswan
7. Kiranmai Dutt, P *et al. 2011. A Course in Communication Skills. New Delhi: CUP India*
8. Krishnaswamy, N. 2000. *Modern English – A Book of Grammar, Vocabulary and Usage.* Macmillan India Pvt. Ltd
9. Ramachandran, K K. *et al.* 2007. *Business Communication.* New Delhi: Macmillan
10. Taylor, Ken. 2011. *50 ways to improve your Business English*. Hyderabad: Orient Blackswan

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR I SEMESTER

CN1A13
PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

(AUDIT-1)

Course Objectives

1. To learn to achieve the highest goal happily

2. To become a person with stable mind, pleasing personality and determination

3. To awaken wisdom in students

UNIT - I

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism) ,Verses- 26,28,63,65 (virtue) , Verses- 52,53,59 (dont's) ,Verses- 71,73,75,78 (do's)

UNIT - II

- Approach to day to day work and duties
- Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT - III

- Statements of basic knowledge.
- Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad BhagwadGeeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Suggested reading

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata

2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, 4. Rashtriya Sanskrit Sansthanam, New Delhi.

MASTER OF TECHNOLOGY
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I YEAR I SEMESTER

CN1A14

VALUE EDUCATION
(AUDIT-1)

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

UNIT - I

Values and self-development – Social values and individual attitudes. Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments

UNIT - II

Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity, Power of faith , National Unity, Patriotism, Love for nature, Discipline

UNIT - III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking,Integrity and discipline. Punctuality, Love and Kindness, Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance.

UNIT - IV

True friendship. Happiness Vs suffering, love for trut, Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT - V

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control.Honesty, Studying effectively

TEXTBOOK:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

MASTER OF TECHNOLOGY
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I YEAR I SEMESTER

CN1A15

CONSTITUTION OF INDIA
(AUDIT-1)

Course Objectives:
Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

UNIT - I

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution:Preamble Salient Features

UNIT - II

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.

UNIT - III

Organs of Governance: Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT - IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT - V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2C10

ADHOC AND SENSOR NETWORKS
(CORE-4)

Prerequisites

- Computer Networks
- Distributed Systems / Distributed Operating Systems / Advanced Operating Systems
- Mobile Computing

Objectives

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for adhoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Outcomes

- Understanding the state of the art research in emerging subject of ad hoc and wireless sensor networks (ASN)
- Ability to solve the issues in real-time application development based on ASN
- Ability to conduct further research in the ASN domain

UNIT I : **Introduction to Ad Hoc Networks:** Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. **Wireless Sensor Networks:** Introduction, Design Issues, Energy Consumption, Clustering of Sensors, Applications.

UNIT II : Routing in MANETs: Topology-Based versus Position-Based Approaches, Topology-Based Routing Protocols, Position-Based Routing, Other Routing Protocols

UNIT III : TCP over Ad Hoc Networks : TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT IV : Data Retrieval in Sensor Networks: Classification of WSNs, MAC Layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V : Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Wireless Sensor Networks.

Text Books:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3

References:

1. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2C20

APPLICATIONS OF NETWORK SECURITY
(CORE-5)

UNIT – I

Security considerations in Mobile & wireless Computing: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in mobile and Wireless Computing Era, Security Challenges posed by Mobile Devices, registry Settings by Mobile Devices, Authentication Service Security, Mobile Devices: Security Implications for Organizations.

UNIT –II

IEEE 802.11 Wireless Lan Security: Background, Authentication:Pre- WEP Authentication, Authentication in WEP, Authentication and key agreement in 802.11i, Confidentiality and Integrity: Data protection in WEP, Data protection in TKIP and CCMP

UNIT – III

CellPhone Security: Preliminaries, GSM(2G) Security, Security in UMTS(3G)

UNIT –I V

Biometrics-Based Security: Issues and Challenges: Introduction, Criteria for Selection of Biometrics Application, classification of Biometrics Applications, Architectural and Design Issues in Biometrics Systems, Interoperability Issues in Biometrics Systems, Standards for Biometrics, Cost of Biometrics, Economic and Social Aspects of Biometrics, Legal Challenges of Biometrics

UNIT – V

Intrusion Prevention and Detection: Introduction, Prevention versus Detection, Types of Intrusion Detection systems, DdoS Attack Prevention/Detection, Malware Detection

TEXT BOOKS:

1. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning
2. Information systems Security: Nina Godbole, Wiley India.

REFERENCES:

1. Cyber Security : Nina Godbole, Sunit Belapure, Wiley India.
2. Network Security Hacks: Andrew Lockhart, O'Reilly, SPD.
3. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2nd Edition
4. Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH
5. Wireless Security-Models, Threats, and Solutions: Randall K.Nichols, Panos C.Lekkas, TMH

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2C30

MACHINE LEARNING
(CORE –6)

Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.

UNIT – I

Introduction: An illustrative learning task, and a few approaches to it. What is known from algorithms? Theory, Experiment. Biology. Psychology. Overview of Machine learning, related areas and applications. Linear Regression, Multiple Regression, Logistic Regression,logistic functions

Concept Learning: Version spaces. Inductive Bias. Active queries. Mistake bound/ PAC model. basic results. Overview of issues regarding data sources, success criteria.

UNIT –II

Decision Tree Learning: - Minimum Description Length Principle. Occam's razor. Learning with active queries Introduction to information theory, Decision Trees, Cross Validation and Over fitting

Neural Network Learning: Perceptions and gradient descent back propagation, multilayer networks and back propagation.

UNIT –III

Sample Complexity and Over fitting: Errors in estimating means. Cross Validation and jackknifing VC dimension. Irrelevant features: Multiplicative rules for weight tuning.

Support Vector Machines: functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers, primal/dual problems, KKT conditions, dual of the optimum margin classifier, soft margins, and kernels.

Bayesian Approaches: The basics Expectation Maximization. Bayes theorem, Naïve Bayes Classifier, Markov models,Hidden Markov Models

UNIT—IV

Instance-based Techniques: Lazy vs. eager generalization. K nearest neighbor, case- based reasoning.

Clustering and Unsupervised Learning: K-means clustering, Gaussian mixture density estimation, model selection

UNIT—V

Genetic Algorithms: Different search methods for induction - Explanation-based Learning: using prior knowledge to reduce sample complexity.

Dimensionality reduction: feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multidimensional scaling, manifold learning

TEXT BOOKS:

1. Tom Michel, Machine Learning, McGraw Hill, 1997
2. Trevor Has tie, Robert Tibshirani & Jerome Friedman. The Elements of Statically Learning, Springer Verlag, 2001

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.

2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001

3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

Outcomes:

- Student should be able to understand the basic concepts such as decision trees and neural networks.
- Ability to formulate machine learning techniques to respective problems.
- Apply machine learning algorithms to solve problems of moderate complexity

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2E11

MOBILE COMPUTING
(ELECTIVE - 3)

UNIT I :
Mobile Computing: Novel Applications, Limitations of Mobile Computing, **Mobile Computing Architecture**: Programming languages, Functions of Operating Systems, Functions of Middleware for mobile Systems, Mobile Computing Architectural layers, Protocols, Layers.

UNIT II
Mobile Devices: Handheld Mobile Smartphones with Multimedia Functionalities, Smartcards, Smart Sensors,**Mobile System Networks**: Cellular Network, WLAN Network and Mobile IP, Ad-hoc Networks, **Mobility Management**

UNIT III:
Global System For Mobile Communications (Gsm): Mobile Services, System Architecture, Protocols, Localization & Calling, Handover, Security. **GPRS:** GPRS System Architecture, **UMTS**: UMTS System Architecture. **LTE**: Long Term Evolution

UNIT IV:
Mobile Network Layer: Mobile IP: Goals, Assumptions, Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP) **Mobile Transport Layer:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, TCP over 2.5G/3G Wireless Networks.

UNIT V:
Security Issues in Mobile Computing: Introduction, Information Security, Security Techniques and Algorithms, Security Protocols, Security Models, Security Frameworks for mobile Environment

TEXT BOOKS:
1. Raj Kamal, “Mobile Computing”, OXFORD UNIVERSITY PRESS.
2. Asoke K Talukder, et al, “Mobile Computing”, Tata McGraw Hill, 2008.

REFERENCES:
1. Jochen Schiller, “Mobile Communications”, Pearson Education, Second Edition, 2008.
2. Dr. Sunilkumar, et al “Wireless and Mobile Networks: Concepts and Protocols”, Wiley India.
3. Matthew S.Gast, “802.11 Wireless Networks”, SPD O’REILLY.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2E12

COMPUTER FORENSICS
(ELECTIVE – 3)

Objectives:

To understand the cyberspace

To understand the forensics fundamentals

To understand the evidence capturing process.

To understand the preservation of digital evidence.

UNIT I :

Computer Forensics Fundamentals: Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics MethodoNS2L20logy, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence?.**Types of Computer Forensics Technology :** Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensics Technology.

UNIT II :

Computer Forensics Evidence and Capture: Data Recovery: Data Recovery Defined, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Case Histories.**Evidence Collection and Data Seizure:** Why Collect Evidence?, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collecting and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

UNIT III: Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting And Preserving Computer Forensic Evidence. **Computer Image Verification and Authentication :** Special Needs of Evidential Authentication, Practical Considerations, Practical Implementation.

UNIT IV: Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool, **Identification of Data:** Timekeeping, Time Matters,Forensic Identification and Analysis of Technical Surveillance Devices.

Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. **Networks:** Network Forensics Scenario, A Technical Approach, Destruction of Email, Damaging Computer Evidence, International Principles Against Damaging of Computer Evidence, Tools Needed for Intrusion Response to the Destruction of Data, Incident Reporting and Contact Forms

UNIT V: Current Computer Forensics Tools: Evaluating Computer Forensics Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.

TEXT BOOKS:

1.“Computer Forensics : Computer Crime Scene Investigation”, JOHN R. VACCA, Firewall Media.
2.“Guide to Computer Forensics and Investigations”4e, Nelson, Phillips Enfinger, Steuart, Cengage Learning.

REFERENCES:

1. “Computer Forensics and Cyber Crime”, Marjie T Britz, Pearson Education.
2. “Computer Forensics”, David Cowen, Mc Graw Hill.
3. Brian Carrier , "File System Forensic Analysis" , Addison Wesley, 2005
4. Dan Farmer & Wietse Venema ,"Forensic Discovery", Addison Wesley, 2005
5. Eoghan Casey , ―Digital Evidence and Computer Crime ―, Edition 3, Academic Press, 2011
6. Chris Pogue, Cory Altheide, Todd Haverkos ,Unix and Linux Forensic Analysis DVD ToolKit, Syngress Inc. , 2008
7. Harlan Carvey ,Windows Forensic Analysis DVD Toolkit, Edition 2, Syngress Inc. , 2009
8. Harlan Carvey ,Windows Registry Forensics: Advanced Digital Forensic Analysis of the Windows Registry , Syngress Inc, Feb 2011
9. Eoghan Casey, Handbook of Digital Forensics and Investigation, Academic Press, 2009
10. Gonzales/ Woods/ Eddins, Digital Image Processing using MATLAB, 2nd edition, Gatesmark Publishing, ISBN 9780982085400
11. N.Efford, Digital Image Processing, Addison Wesley 2000, ISBN 0-201-59623-7
12. M Sonka, V Hlavac and R Boyle, Image Processing, Analysis and Machine Vision, PWS
13. 1999, ISBN 0-534-95393-
14. Pratt.W.K., Digital Image Processing, John Wiley and Sons, New York, 1978

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2E13

SOFTWARE QUALITY ASSURANCE AND TESTING
(ELECTIVE – 3)

Objectives:

The student should be able to:

- To understand software testing and quality assurance as a fundamental component of software life cycle
- To define the scope of SW T&QA projects
- To efficiently perform T&QA activities using modern software tools
- To estimate cost of a T&QA project and manage budgets
- To prepare test plans and schedules for a T&QA project
- To develop T&QA project staffing requirements
- To effectively manage a T&QA project

UNIT I

Software Quality Assurance and Standards: The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance, SQA unit and other actors in SQA system. - **(Chapters: 1-4, 21-23, 25, 26) of T3 Quality Standards:** ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma and other latest quality standards **(Refer Internet and R11, R12, R13).**

UNIT II

Software Testing Strategy and Environment: Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy **Building Software Testing Process:** Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, Process Preparation checklist **- (Chapters: 2,3) of T1 Software Testing Techniques:** Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing **-(Chapters: 4, 5, 6, 7, 8) of T2**

UNIT III

Software Testing Tools: Selecting and Installing Software Testing tools – **(Chapter 4) of T1.** Automation and Testing Tools **- (Chapter 15) of T2** Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus. **(Refer Internet and R9, R10)**

UNIT IV

Testing Process Seven Step Testing Process – I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing. **(Chapters 6, 7, 8, 9, 10) of T1**

UNIT V

Seven Step Testing Process – II: Analyzing and Reporting Test results, Acceptance and Operational Testing, Post-Implementation Analysis **Specialized Testing Responsibilities**: Software Development Methodologies, Testing Client/Server Systems **(Chapters 12, 13, 14, 15) of T1.**

TEXT BOOKS:

1. Effective Methods for Software Testing, Third edition, *William E. Perry*, Wiley India, 2009
2. Software Testing – Principles and Practices, *Naresh Chauhan*, Oxford University Press, 2010.
3. Software Quality Assurance – From Theory to Implementation, *Daniel Galin*, Pearson Education, 2009.

REFERENCES:

1. Testing Computer Software, Cem Kaner, Jack Falk, Hung Quoc Nguyen, Wiley India, rp2012.
2. Software Testing – Principles, Techniques and Tools, *M.G.Limaye*, Tata McGraw-Hill, 2009.
3. Software Testing - A Craftsman's approach, *Paul C. Jorgensen*, Third edition, Auerbach Publications, 2010.
4. Foundations of Software Testing, *Aditya P. Mathur*, Pearson Education, 2008.
5. Software Testing and Quality Assurance – Theory and Practice, *Kshirasagar Naik, Priyadashi Tripathy*, Wiley India, 2010.
6. Software Testing, *Ron Patton*, Second edition, Pearson Education, 2006.
7. Software Testing and Analysis – Process, Principles and Techniques, *Mauro Pezze, Michal Young*, Wiley India, 2008.
8. Software Testing Techniques, Boris Beizer, Second edition, Wiley India, 2006
9. Foundations of Software Testing, Dorothy Graham, et al., Cengage learning, 2007, rp 2010.
10. Software Testing - Effective Methods, Tools and Techniques, *Renu Rajani, Pradeep Oak*, Tata McGraw-Hill, rp2011.
11. Software Automation Testing Tools for Beginners, *Rahul Shende*, Shroff Publishers and Distributors, 2012.
12. Software Testing Tools, *K.V.K.K. Prasad*, Dream Tech Press, 2008.
13. Software Testing Concepts and Tools, *Nageswara Rao Pusuluri*, Dream Tech press, 2007.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2E14

DATA SCIENCE
(ELECTIVE –3)

Objectives:
To understand about big data, to learn the analytics of Big Data
To understand how data is stored and processed in Hadoop
To learn about NoSQL databases
To learn R tool and understand how data is analyzed using R features
To learn about spark and to understand what features of it are making it to overtake hadoop

UNIT I
Types of Digital data: Classification of Digital Data,
Introduction to Big Data: What is big data, Evolution of Big Data, Traditional Business Intelligence vs Big Data, Coexistence of Big Data and Data Warehouse.
Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Why Big Data Analytics Important, Data Science, Terminologies used in Big Data Environments.

UNIT II
Hadoop: Features of Hadoop, Key advantages of hadoop, versions of hadoop, overview of hadoop ecosystem, Hadoop distributions.
Why hadoop? RDBMS vs Hadoop, Distribution computing challenges, History of hadoop, Hadoop overview,HDFS

UNIT III
Processing data with hadoop, interfacing with hadoop ecosystem.
NoSQL: Where it is used? What is it? Types of NoSQL Databases, Why NoSQL? Advantages of NoSQL, What we miss with NoSQL? Use of NoSQL in industry,SQL vs NoSQL.

UNIT IV
What is R? Why use R for analytics? How to run R? First R example, functions a short programming example, some important R data structures, vectors, matrices, lists, R programming structures.

UNIT V
Introduction to Spark, Scala language: values, data types, variables, expressions, conditional expressions, evaluation order, compound expressions, functions, tuple with functions, List, Length, ++, ::, sorted, reverse, sum. slice, mkString, contains, map, filter, leftfold, reduce, Map, Contains, getOrElse, WithDefault, Keys and Values, groupBy, set, mapValues, keys and values, Option(Some and None), Objects, classes, inheritance, traits

TEXT BOOKS:

1. BIG DATA and ANALYTICS, Seema Acharya, Subhashini Chellappan, Wiley publications.(Unit I, II, III)
2. BIG DATA, Black Book^{TM}, DreamTech Press, 2015 Edition.

3. "The art of R programming" by Norman matloff, 2009.(Unit IV)
4. "Atomic Scala", 2nd edition, Bruce Eckel, Dianne Marsh. (Unit V)

REFERENCE BOOKS:

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss,ShakuAtre, " Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, " Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.
4. "Hadoop: The definitive guide", by O'reilly, yahoo press, 2nd edition.
5. "Introduction to R" by Sandeep Rakshit, McGrawHill Education, 2016.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2E15

ETHICAL HACKING
(ELECTIVE – 3)

Learning Objectives:

- *To learn the ethics and legality of hacking*
- *To learn about the hacking tools*
- *To learn the hacking of servers and OS*

UNIT I

Introduction to Ethical Hacking, Ethics, and Legality

Ethical Hacking Terminology, Different Types of Hacking Technologies, Different Phases Involved in Ethical Hacking and Stages of Ethical Hacking: Passive and Active Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks, Hacktivism, Types of Hacker Classes, Skills Required to Become an Ethical Hacker, Vulnerability Research, Ways to Conduct Ethical Hacking, Creating a Security Evaluation Plan ,Types of Ethical Hacks, Testing Types, Ethical Hacking Report

Footprinting and Social Engineering

Footprinting, Information Gathering Methodology, Competitive Intelligence ,DNS Enumeration Whois and ARIN Lookups, Types of DNS Records, Traceroute, E-Mail Tracking ,Web Spiders , Social Engineering, Common Types Of Attacks, Insider Attacks, Identity Theft, Phishing Attacks, Online Scams, URL Obfuscation, Social-Engineering Countermeasures.

UNIT II

Scanning and Enumeration

Scanning, types of Scanning , CEH Scanning Methodology ,Ping Sweep Techniques, Nmap Command Switches, SYN, Stealth, XMAS, NULL, IDLE, and FIN Scans, TCP Communication Flag Types, War-Dialing Techniques, Banner Grabbing and OS Fingerprinting Techniques, Proxy Servers, Anonymizers, HTTP Tunneling Techniques, IP Spoofing Techniques , Enumeration, Null Sessions, SNMP Enumeration, Windows 2000 DNS Zone Transfer, Steps Involved in Performing Enumeration

System Hacking

Understanding Password-Cracking Techniques, Understanding the LanManager Hash Cracking Windows 2000 Passwords, Redirecting the SMB Logon to the Attacker SMB Redirection, SMB Relay MITM Attacks and Countermeasures NetBIOS DoS Attacks, Password-Cracking

Countermeasures, Understanding Different Types of Passwords Passive Online Attacks, Active Online Attacks, Offline Attacks Nonelectronic Attacks, Understanding Keyloggers and Other Spyware Technologies

Understand Escalating Privileges, Executing Applications, Buffer Overflows, Understanding Rootkits Planting Rootkits on Windows 2000 and XP Machines, Rootkit Embedded TCP/IP Stack Rootkit Countermeasures, Understanding How to Hide Files, NTFS File Streaming NTFS Stream Countermeasures, Understanding Steganography Technologies, Understanding How to Cover Your Tracks and Erase Evidence, Disabling Auditing, Clearing the Event Log

UNIT III

Trojans, Backdoors, Viruses, and Worms

Trojans and Backdoors, Overt and Covert Channels, Types of Trojans, Reverse-Connecting Trojans, Netcat Trojan ,Indications of a Trojan Attack, Wrapping, Trojan Construction Kit and Trojan Makers , Countermeasure Techniques in Preventing Trojans, Trojan-Evading Techniques, System File Verification Subobjective to Trojan Countermeasures Viruses and Worms, Difference between a Virus and a Worm, Types of Viruses, Understand Antivirus Evasion Techniques, Understand Virus Detection Methods

Sniffers

Protocols Susceptible to Sniffing, Active and Passive Sniffing, ARP Poisoning, Ethereal Capture and Display Filters, MAC Flooding, DNS Spoofing Techniques, Sniffing Countermeasures

Denial of Service and Session Hijacking

Denial of Service, Types of DoS Attacks, DDoS Attacks, BOTs/BOTNETs, "Smurf" Attack, "SYN" Flooding, DoS/DDoS Countermeasures, Session Hijacking, Spoofing vs. Hijacking, Types of Session Hijacking, Sequence Prediction, Steps in Performing Session Hijacking, Prevention of Session Hijacking

UNIT IV

Hacking Web Servers, Web Application Vulnerabilities, and Web-Based Password Cracking Techniques

Hacking Web Servers, Types of Web Server Vulnerabilities, Attacks against Web Servers, IIS Unicode Exploits, Patch Management Techniques, Web Server Hardening Methods Web Application Vulnerabilities, Objectives of Web Application Hacking, Anatomy of an Attack, Web Application Threats, Google Hacking, Web Application Countermeasures Web-Based Password Cracking Techniques, Authentication Types, Password Cracker, Password Attacks: Classification ,Password-Cracking Countermeasures

SQL Injection and Buffer Overflows

SQL Injection, Steps to Conduct SQL Injection, SQL Server Vulnerabilities, SQL Injection Countermeasures Buffer Overflows, Types of Buffer Overflows and Methods of Detection, Stack-Based Buffer Overflows, Buffer Overflow Mutation Techniques

UNIT V

Linux Hacking

Linux Basics, Compile a Linux Kernel, GCC Compilation Commands, Install Linux Kernel Modules, Linux Hardening Methods

Penetration Testing Methodologies

Security Assessments, Penetration Testing Methodologies, Penetration Testing Steps, Pen-Test Legal Framework , Automated Penetration Testing Tools ,Pen-Test Deliverables

TEXT BOOKS:

1. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition
2. Certified Ethical Hacker: Michael Gregg, Pearson Education
3. Certified Ethical Hacker: Matt Walker, TMH.

Reference Books:

1. Computer Security, concepts, issues and implementation: Alfred Basta Wolf Halton, Cengage Learning
2. Hacking Exponsed Web 2.0, by Rich Annings, Himanshu Dwivedi, Zane Lackey, Tata Mcgraw hill Edition
3. Ethical Hacking & Network Defense, Michael T. Simpson, Cengage Learning
4. Hacking Exposed Windows, Joel Scambray, cissp, Stuart Mcclure, Cissp, Third Edition, Tata Mcgraw hill edition
5. Hacking Exposed Window server 2003, Joel Scambray Stuart Mcclure, Tata Mcgraw hill edition

MASTER OF TECHNOLOGY
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CN2E21

IT SECURITY METRICS
(ELECTIVE - 4)

Learning Objectives:

- To learn security metrics
- To learn The Security Process Management Framework
- To learn Measurements Security Operations
- To learn Measuring Security Cost and Value
- To learn The Security Improvement Program

UNIT-1: What Is a Security Metric? Metric and Measurement, Security Metrics Today, The Dissatisfying State of Security Metrics, Reassessing Our Ideas About Security Metrics. **Designing Effective Security Metrics:** Choosing Good Metrics, GQM for Better Security Metrics, More Security Uses for GQM, Summary.

UNIT-2: Understanding Data: What Are Data? Data Sources for Security Metrics; We Have Metrics and Data -Now what, Summary, Case Study 1. **The Security Process Management Framework:** Managing Security as a Business Process, the SPM Framework, Before You Begin SPM, Summary. **The Analyzing Security Metrics Data:** The Most Important Step, Analysis Tools and Techniques, Summary**. Designing the Security Measurement Project:** Before the Project Begins, Phase One: Build a Project Plan and Assemble the Team, Phase two: Gather the Metrics Data, phase Three: Analyze the Metrics Data and Build Conclusions, phase Four: Present Results, Phase Five: Reuse the Results, Project Management Tools, Summary.

UNIT-3: Measurements Security Operations: Sample Metrics for Security Operations, Sample Measurement Project for Security Operations, Summary. **Measuring Compliance and Conformance:** The Challenges of Measuring Compliance, Sample Measurement Projects for Compliance and Conformance, Summary.

UNIT-4: Measuring Security Cost and Value: Sample Measurement Projects for Compliance and Conformance, The Importance of Data to Measuring Cost and Value, Summary. **Measuring People, Organizations, and Culture:** Sample Measurement Projects for People, Organizations, and Culture, Summary.

UNIT-5: The Security Improvement Program: Moving from Projects to Programs, Managing Security Measurement with a Security, Requirements for a SIP, Measuring the SIP, Summary. **Learning Security: Different Contexts for Security Process Management:** Organizational Learning, Three Learning Styles for IT Security Metrics, Final Thoughts, Summary.

TEXTBOOKS:

1. IT SECURITY METRICS, Lance Hayden, TATA McGraw-HILL.
2. SECURITY METRICS, CAROLINE WONG, TATA McGraw-HILL.

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CN2E22

WIRELESS SECURITY
(ELECTIVE - 4)

UNIT – I

Security Issues in Mobile Communication: Mobile Communication History, Security – Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications, Security for Mobile Applications, Advantages and Disadvantages of Application – level Security

UNIT – II

Security of Device, Network, and Server Levels: Mobile Devices Security Requirements, Mobile Wireless network level Security, Server Level Security

UNIT – III

Application Level Security in Cellular Networks: Generations of Cellular Networks, Security Issues and attacks in cellular networks, GSM Security for applications, GPRS Security for applications, UMTS security for applications, 3G security for applications, Some of Security and authentication Solutions

UNIT – IV

Application Level Security in MANETs: MANETs, Some applications of MANETs, MANET Features, Security Challenges in MANETs, Secutiry Atacks on MANETs, External Threats for MANET applications, Internal threats for MANET Applications, Some of the Security Solutions

UNIT – V

Security for mobile commerce applications: M-Commerce Applications, M-Commerce Initiatives, Security Challenges in mobile e-commerce, Types of attacks on mobile e-commerce, A Secure M-commerce model based on wireless local area network, Some of M-Commerce Security Solutions.

TEXT BOOKS:

1. Wireless & Mobile Network Security: Pallapa Venkataram, Satish Babu, TMH, 2010.
2. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein, K.S.Gupta et al, TMH 2005.

REFERENCES:

1. Wireless Security Models, Threats and Solutions, Randall k. Nichols, Panos C. Lekkas, TMH, 2006.
2. 802.11 Security, Bruce Potter & Bob Fleck, SPD O'REILLY 2005.
3. Guide to Wireless Network Security, Springer.
4. Hacking Exposed Wireless: Johnny Cache, 2nd Edition, Joshua Wright, Vincent Lu, Mc Graw Hill.

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CN2E23

INFORMATION SYSTEMS CONTROL AND AUDIT
(ELECTIVE - 4)

Objectives:

- To understand the foundations of information systems auditing
- To understand the management, application control framework
- To understand about the evidence collection and evidence evaluation process

UNIT- I

Overview of Information System Auditing, Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit. The management Control Framework-I: Introduction, Evaluating the planning Function, Evaluating the Leading Function, Evaluating the Controlling Function, Systems Development Management Controls, Approaches to Auditing Systems Development, Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT- II

The Management Control Framework-II: Security Management Controls, Operations management Controls Quality assurance Management Controls.
The Application Control Framework-I: Boundary Controls, Input Controls, Communication Controls.

UNIT-III

The Application Control Framework-II: Processing Controls, Database Controls, output Controls.

UNIT- IV

Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools.

UNIT -V

Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency.

TEXT BOOKS:

1. Ron Weber, Information Systems Control and Audit, Pearson Education, 2002.

REFERENCES:

1. M.Revathy Sriram, Systems Audit, TMH, New Delhi, 2001.
2. Jalote : Software Project Management in Practice, Pearson Education
3. Royce : Software Project Management, Pearson Education.

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CN2E24

CLOUD COMPUTING
(ELECTIVE - 4)

Objectives:

- Cloud computing has evolved as a very important computing model, which enables information, software, and shared resources to be provisioned over the network as services in an on-demand manner.
- This course provides an insight into what is cloud computing and the various services cloud is capable.

UNIT I:

Computing Paradigms, High-Performance Computing, Parallel Computing.,Distributed Computing..,ClusterComputing.,Grid Computing, Cloud Computing., Biocomputing, Mobile Computing.,QuantumComputing, Optical Computing. Nanocomputing.

UNIT II:

Cloud Computing Fundamentals: Motivation for Cloud Computing,The Need for Cloud Computing,Defining Cloud Computing, Definition of Cloud computing,Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing,Five Essential Characteristics...Four Cloud Deployment Models

UNIT III:

Cloud Computing Architecture and Management: Cloud architecture, Layer,Anatomy of the Cloud,Network Connectivity in Cloud Computing, Applications, on the Cloud,Managing the Cloud,Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT IV:

Cloud Service Models: Infrastructure as a Service,Characteristics of IaaS.Suitability of IaaS,Pros and Cons of IaaS,Summary of IaaS Providers,Platform as a Service,Characteristics of PaaS,Suitability of PaaS,Pros and Cons of PaaS,Summary of PaaS Providers,Software as a Service,Characteristics of SaaS,Suitability of SaaS,Pros and Cons of SaaS,Summary of SaaS Providers.Other Cloud Service Models

UNIT V:

Cloud Service Providers:EMC,EMC IT,Captiva Cloud Toolkit,Google,Cloud Platform,Cloud Storage,Google Cloud Connect,Google Cloud Print,Google App Engine,Amazon Web Services,Amazon Elastic Compute Cloud,Amazon Simple Storage Service,Amazon Simple Queue ,ervice,Microsoft,Windows Azure,Microsoft Assessment and Planning Toolkit,SharePoint,IBM,Cloud Models,IBM SmartCloud,SAP Labs,SAP HANA Cloud

Platform,Virtualization Services Provided by SAP,Salesforce,Sales Cloud,Service Cloud: Knowledge as a Service,Rackspace,VMware,Manjrasoft,Aneka Platform

TEXT BOOKS:

1. Essentials of cloud Computing : K.Chandrasekhran , CRC press, 2014

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing , Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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CN2E25

CRYPTANALYSIS
(ELECTIVE - 4)

Prerequisites : *A Course on "Computer Networks, Mathematics"*

Objectives:

- To understand the importance of cryptanalysis in our increasingly computer-drivenworld.
- To understand the fundamentals of Cryptography
- To understand the Lattice- based cryptanalysis and elliptic curves and pairings
- To understand birthday- based algorithms for functions and attacks on stream ciphers
- To apply the techniques for secure transactions in real world applications

Outcomes :

- Ability to apply cryptanalysis in system design to protect it from various attacks.
- Ability to identify and investigate vulnerabilities and security threats and the mechanisms to counter them.
- Ability to analyze security of cryptographic algorithm against brute force attacks, birthday attacks.

UNIT-I :
A bird's – eye view of modern Cryptography: Preliminaries, Defining Security in Cryptography **Monoalphabetic Ciphers:** Using Direct Standard Alphabets, The Caesar Cipher, Modular arithmetic, Direct Standard alphabets, Solution of direct standard alphabets by completing the plain component, Solving direct standard alphabets by frequency considerations, Alphabets based on decimations of the normal sequence, Solution of decimated standard alphabets, Monoalphabets based on linear transformation. **Polyalphabetic Substitution:** Polyalphabetic ciphers, Recognition of polyalphabetic ciphers, Determination of number of alphabets, Solution of individual alphabets if standard, Polyalphabetic ciphers with a mixed plain sequences, Matching alphabets , Reduction of a polyalphabetic cipher to a monoalphabetic ciphers with mixed cipher sequences

UNIT- II:
Transposition : Columnar transposition, Solution of transpositions with Completely filled rectangles ,Incompletely filled rectangles, Solution of incompletely filled rectangles – Probable word method, Incompletely filled rectangles general case, Repetitions between messages ; identical length messages. **Sieve algorithms:** Introductory example: Eratosthenes's sieve, Sieving for smooth composites

UNIT- III:
Brute force Cryptanalysis: Introductory example: Dictionary attacks , Brute force and the DES Algorithm, Brute force as a security mechanism, Brute force steps in advanced cryptanalysis, Brute force and parallel computers. **The birthday paradox: Sorting or not?:** Introductory

example: Birthday attacks on modes of operation, Analysis of birthday paradox bounds, Finding collisions, Application to discrete logarithms in generic groups.

UNIT- IV:

Birthday- based algorithms for functions: Algorithmic aspects, Analysis of random functions, Number-theoretic applications, A direct cryptographic application in the context of blockwise security, Collisions in hash functions. **Attacks on stream ciphers:** LFSR- based key stream generators, Correlation attacks, Noisy LFSR model, Algebraic attacks, Extension to some non-linear shift registers, The cube attack.

UNIT-V:

Lattice- based cryptanalysis: Direct attacks using lattice reduction, Coppersmith's small roots attacks. **Elliptic curves and pairings:** Introduction to elliptic curves, The Weil pairing, the elliptic curve factoring method.

Text Books:

1. "Elementary Cryptanalysis A Mathematical Approach" by Abraham Sinkov, The mathematical Association of America (lnc).
2. "Algorithmic Cryptanalysis" by Antoine joux, CRC Press'

References:

1. Algebraic Cryptanalysis, Bard Gregory, Springer, 2009
2. Cryptanalysis of Number Theoretic Ciphers, Sameul S. Wag staff, Champan & Hall/CRC 3. Cryptanalysis: A Study of Cipher and Their Solution, Helen F. Gaines,1989

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I YEAR II SEMESTER

CN2L10

NETWORK SIMULATION & NETWORK SECURITY LAB
(LAB - 3)
NETWORK SIMULATION

Sample Problems on Network Simulation (Use Simulation tools like NetSim/NS2, etc)

1. Installation of simulation tools in Linux/Windows environment
2. Introduction about discrete events simulation and its tools like NetSim, NS2, etc
3. Study the throughputs of Slow start + Congestion avoidance(Old Tahoe) and Fast Retransmit (Tahoe) Congestion Control Algorithms
4. Study how the Data Rate of Wireless LAN(IEEE 802.11b) Network varies as the distance between the Access Point and the wireless nodes is varied
5. Study the working and routing table formation of Interior routing table formation of interior routing protocol , i.e. Routing Information Protocol (RIP)
6. Study the working and routing table formation of Interior routing table formation of interior routing protocol , i.e. Open Shortest Path First(OSPF)
7. Analyze the performance of a MANET,(running CSMA/CA(802.11b) in MAC)with increasing node density
8. Analyze the performance of a MANET,(running CSMA/CA(802.11b) in MAC)with increasing node mobility
9. Study the working of BGP and formation of BGP Routing table
10. Study how call blocking probability varies as the load on a GSM network is continuously increased.
11. Bit Stuffing and character stuffing
12. Cyclic Redundancy Check
13. Encryption and Decryption using substitution ciphers
14. Distance vector Routing
15. Link State Routing
16. Go Back N Protocol
17. MANET Routing Protocols
18. Experiments on GSM, LTE, 5G Networks

NETWORK SECURITY

The experiments are divided into **Part-A & B.**
PART – A exercises are based on the cryptographic algorithms. They can be implemented using C, C++, Java, etc.

1. Write a Java program to perform encryption and decryption using the following
2. algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
3. Write a C/JAVA program to implement the DES algorithm logic.
4. Write a C/JAVA program to implement the Blowfish algorithm logic.
5. Write a C/JAVA program to implement RSA algorithm.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Using Java cryptography, encrypt the text "Hello world" using Blowfish. Create your
8. own key using Java keytool.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Consider the end user as one of the parties(Alice) and the JavaScript application as the
11. other party(Bob)
12. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
13. Calculate the message digest of a text using the MD5 algorithm in JAVA.

Part – B exercises have to be performed using various software tools/utilities mentioned

1. Passive Information Gathering
- a. IP Address and Domain Identification of log entries – DNS, RIR, etc tools
- b. Information Gathering of a web site: WHOIS, ARIN, etc tools
- c. Banner Grabbing: Netcat, etc tools

2. Detecting Live Systems
- a. Port Scanning : Nmap,SuperScan
- b. Passive Fingerprinting: Xprobe2
- c. Active Fingerprinting: Xprobe2

3. Enumerating Systems
- a. SNMP Enumeration: SolarWinds IP Network Browser, www.solarwinds.com/downloads
- b. Enumerating Routing Protocols: Cain & Abel tool, www.oxid.it

4. Automated Attack and Penetration Tools
- a. Exploring N-Stalker, a Vulnerability Assessment Tool, www.nstalker.com

5. Defeating Malware
- a. Building Trojans, Rootkit Hunter: www.rootkit.nl/projects/rootkit_hunter.html
- b. Finding malware

6. Securing Wireless Systems
- a. Scan WAPs: NetStumbler, www.netstumbler.com/downloads
- b. Capture Wireless Traffic: Wireshark, www.wireshark.org

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CN2L21

MOBILE COMPUTING LAB
(ELECTIVE 3 LAB)
(LAB - 4)

Study and Simulate the following Networks :

1. Internetworks - Ethernet - Fast & Gigabit, ARP, Routing - RIP, OSPF, WLAN - 802.11 a / b / g /p / n / ac & e
2. Legacy Networks - Aloha (Pure & Slotted), CSMA/CD, Token Ring, Token Bus
3. BGP
4. Advanced Wireless Networks - MANET - DSR, AODV, OLSR, ZRP. Wi-Max
5. Cellular Networks - GSM and CDMA
6. Wireless Sensor Networks
7. Internet Of Things - IOT with RPL protocol
8. Zigbee
9. Cognitive Radio Networks - WRAN
10. Long Term Evolution Networks - LTE, LTE - Advanced, LTE Device to Device (LTE D2D), LTE Femto Cell
11. Vehicular Adhoc Networks - IEEE 1609 WAVE, Basic Safety Message (BSM) protocol per J2735 DSRC, Interface with SUMO for road traffic simulation

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CN2L22

COMPUTER FORENSICS LAB
(ELECTIVE 3 LAB)
(LAB - 4)

To perform the following tasks for the lab, Internet facility and open source tools should be provided.

1. Use a Web search engine, such as Google or Yahoo!, and search for companies specializing in computer forensics. Select three and write a two-to three-page paper comparing what each company does.(Project 1-1)
2. Search the Internet for articles on computer crime prosecutions. Find at least two. Write one to two pages summarizing the two articles and identify key features of the decisions you find in your search. (Project 1-5)
3. Use a Web search engine, search for various computer forensics tools.
4. Preparing and processing of investigations. Try to examine and identify the evidences from the drives. (Project 2-1)
5. Extracting of files that have been deleted.((Project 2-4)
6. Illustrate any Data acquisition method and validate. Use an open source data acquisition tool.
7. You're investigating an internal policy violation when you find an e-mail about a serious assault for which a police report needs to be filed. What should you do? Write a two-page paper specifying who in your company you need to talk to first and what evidence must be turned over to the police.(Project 5-2)
8. Create a file on a USB drive and calculate its hash value in FTK Imager. Change the file and calculate the hash value again to compare the files.(Project 5-4)
9. Compare two files created in Microsoft Office to determine whether the files are different at the hexadecimal level. Keep a log of what you find. (Project 6-1)
10. Illustrate the analysis of forensic data.
11. Illustrate the validating of forensic data.
12. Locate and extract Image (JPEG) files with altered extensions.(Project 10-1)
13. Examine or Investigate an E-mail message.

TEXT BOOKS:

1. "Computer Forensics and Investigations", Nelson, Phillips Enfinger, Steuart, 3rd Edition, Cengage Learning.

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CN2L23

SOFTWARE TESTING LAB
(ELECTIVE 3 LAB)
(LAB - 4)

Objectives:

The student should be able to:

- To understand software testing and quality assurance as a fundamental component of software life cycle
- To define the scope of SW T&QA projects
- To efficiently perform T&QA activities using modern software tools
- To estimate cost of a T&QA project and manage budgets
- To prepare test plans and schedules for a T&QA project
- To develop T&QA project staffing requirements
- To effectively manage a T&QA project

Software Testing Objectives:

To learn to use the following (or similar) automated testing tools to automate testing:

a) Win Runner/QTP for functional testing.
b) LoadRunner for Load/Stress testing.
c) Test Director for test management.
d) JUnit,HTMLUnit,CPPUnit.

Sample problems on testing:

1. Write programs in 'C' Language to demonstrate the working of the following constructs: i) do...while ii) while….do iii) if…else iv) switch v) for
2. "A program written in 'C' language for Matrix Multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure.
3. Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
4. Write the test cases for any known application (e.g. Banking application)
5. Create a test plan document for any application (e.g. Library Management System)
6. Refer Page no 115 in Text book 2(Foundations of software testing by Rex Black,Erik Van Veenendaal,Dorthy Graham) for the described scenario and observe the given
   ii. Equivalence Partioning /Boundary Value Analysis ii. Decision Tables
   iii. State transition iv. Statement and decision testing.consider any other scenario of your choice and do the same.
7. Refer Page no 158 in Text book 2(Foundations of software testing by Rex Black,Erik Van Veenendaal,Dorthy Graham) for the described scenario and observe the given **Incident Report** and consider any other scenario of your choice and do the same.
8. Study of any testing tool (e.g. Win runner)
9. Study of any web testing tool (e.g. Selenium)
10. Study of any bug tracking tool (e.g. Bugzilla, bugbit)
11. Study of any test management tool (e.g. Test Director)

12. Study of any open source-testing tool (e.g. Test Link)
13. Take a mini project (e.g. University admission, Placement Portal) and execute it. During the Life cycle of the mini project create the various testing documents* and final test report document.

Additional problems on testing:

1. Test the following using JUnit and CPPUnit:
   i) Sorting problems ii) Searching problems
   iii) Finding gcd of two integers iv) Finding factorial of a number.
2. Test web based forms using HTMLUnit.
3. Test database stored procedures using SQLUnit.
   (Use sufficient number of test cases in solving above Problems)

***Note: To create the various testing related documents refer to the text "Effective Software Testing Methodologies by William E. Perry"**

TEXT BOOKS:

1.Software Testing Concepts and Tools, P.Nageswara Rao, Dream Tech Press,2007.
2.Foundations of software testing by Rex Black,Erik Van Veenendaal,Dorthy Graham
3.Software Testing Concepts and Tools by Nageshwara Rao Pusuluri, Drean Tech Press
4.Software Testing Tools, *K.V.K.K. Prasad*, Dream Tech Press, 2008.
5.Software Testing with Visual Studio Team System 2008, S.Subashini, N.Satheesh kumar, Shroff Publishers Distributors.
6.Software Automation Testing Tools for Beginners, *Rahul Shende*, Shroff Publishers and Distributors, 2012.

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CN2L24

DATA SCIENCE LAB
(ELECTIVE 3 LAB)
(LAB - 4)

Objectives

- To make students understand learn about a Big Data –R Programming , way of solving problems.
- To teach students to write programs in Scala to solve problems.

Introduction to R Programming:

What is R and RStudio? R is a statistical software program. It has extremely useful toolsfor data exploration, data analysis, and data visualization. It is flexible and also allows for a dvanced programming. RStudio is a user interface for R, which provides a nice environment for working with R.

1. Write an R program to evaluate the following expression ax+b/ax-b.

2. Write an R program to read input from keyboard(hint: readLine()).

3. Write an R program to find the sum of n natural numbers: 1+2+3+4+….n

4. Write an R program to read n numbers.

(i) Sum of all even numbers (ii) Total number of even numbers.

5. Write an R program to read n numbers.

(i) Total number of odd numbers (ii) Sum of all odd numbers

6. Write an R program to to obtain

(i)sum of two matrices A and B (ii) subtraction of two matrices A and B

(iii) Product of two matrices.

7. Write an R program for " declaring and defining functions "

8. Write an R program that uses functions to add n numbers reading from keyboard

9. Write an R program uses functions to swap two integers.

10. Write an R program that use both recursive and non-recursive functions for implementing the Factorial of a given number, n .

11. Write an R program to reverse the digits of the given number .{ example 1234 to

be written as 4321}

12. Write an R program to implement

(i)Linear search (ii) Binary Search.

13. Write an R program to implement

(i)Bubble sort (ii) selection sort .

14. Write a R program to implement the data structures

(i) Vectors (ii) Array (iii) Matrix (iv) Data Frame (v) Factors

15. Write a R program to implement scan(),merge(), read.csv() and read.table() commands.

16. Write an R program to implement " Executing Scripts" written on the note pad, by calling to the R console.

17. Write a R program ,Reading data from files and working with datasets

(i) Reading data from csv files, inspection of data .

(ii) Reading data from Excel files .

18. Write a R program to implement Graphs

(i)Basic high-level plots (ii)Modifications of scatter plots

(iii)Modifications of histograms, parallel box plots .

PART -2

Introduction to Scala Programming:

1. Write a scala program to demonstrate val and var
2. write a scala program to read data from keyboard
3. write a scala program to implement
(i) single dimensional array (ii) multi - dimensional array.
4. Write a scala program to implement classes, methods , creating objects
5. Write a scala program to returning a value to the main program.
6. Write a scala program to implement method overloading(Function Overloading)
7. Write a scala program to implement
(i)single inheritance (ii) multi level
8. Write a scala program to implement method overriding.
9. Write a scala program to implement Hierarchical inheritance
10. write a scala program to implement traits
11. Write a scala program to implement multiple inheritance
12. write a scala program to implement abstract classes.

13. write a scala program to implement from Collection : Vectors.
14. write a scala program to implement from Collection :MAPS.
15. Write a scala program to implement from collection : LIST.
16. write a scala program implement the statement " traits can be inherited".
17. write a scala program implement the statement " abstract classes" can be inherited".
18. write a scala program implement the statement " abstract classes" can be inherited".

Suggested Books for Lab:

1. Big data – Black Book : 2015 edition: dreamtech press. Pg.(490- 642)
2. Introducing to programming and problem solving by scala,mark c.lewis, lisa l.lacher. CRC press,second edition .

Suggested Links:

1. https://www.tutorialspoint.com/scala/
2. https://www.tutorialspoint.com/r/

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CN2L25

ETHICAL HACKING LAB
(ELECTIVE 3 LAB)
(LAB - 4)

1. Using Active and Passive Techniques for scanning Networks, Enumeration, sniffing to Enumerate Network Hosts.
2. Conducting Active and Passive Footprinting and Reconnaissance against Target.
3. Using Armitage to Attack the Network.
4. Using Metasploit to Attack a Remote System - Scanning Networks, Enumeration, Sniffers, Evading IDS, Firewalls, and Honeypots.
5. Using Malware – Dark Comet for System Hacking, Trojans and Backdoors, Viruses and Worms.
6. Using the SHARK Remote Administration Tool for System Hacking, Trojans and Backdoors, Viruses and Worms.
7. Attacking a System- Using the SYSTEM account – System Hacking, Intrusion Detection – Evading IDS, Firewalls, and Honeypots.
8. Web-Based Hacking Servers and Applications for exploitation with IPv6 – System Hacking, Denial of Service, SQL Injection – Hacking Webservers, Hacking Web Applications, SQL Injection, LaunchingaBuffer Overflow – System Hacking, Buffer Overflow.
9. Cryptography - Breaking Windows Passwords –System Hacking, Using John the Ripper to Crack

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CN2A11

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT-2)

Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
Ensure the good quality of paper at very first-time submission

UNIT - I
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT - II
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT - III
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT - IV
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT - V
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT - VI
useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:
1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2A12

DISASTER MANAGEMENT
(AUDIT-2)

Course Objectives: -

Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I

Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT-II

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT-III

Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

UNIT-IV

Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT-V

Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

UNIT-VI

Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2A13

SOFT SKILLS
(AUDIT-2)-(Activity-**based)**

Course Objectives

- To improve the fluency of students in English
- To facilitate learning through interaction
- To illustrate the role of skills in real-life situations with case studies, role plays etc.
- To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
- To encourage students develop behavioral skills and personal management skills
- To impart training for empowerment, thereby preparing students to become successful professionals

Learning Outcomes

- Developed critical acumen and creative ability besides making them industry- ready.
- Appropriate use of English language while clearly articulating ideas.
- Developing insights into Language and enrich the professional competence of the students.
- Enable students to meet challenges in job and career advancement.

Unit 1 : INTRODUCTION

Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis ***and***

1. **Exercises on Productivity Development**
    - Effective/ Assertive Communication Skills (Activity based)
    - Time Management (Case Study)
    - Creativity & Critical Thinking (Case Study)
    - Decision Making and Problem Solving (Case Study)
    - Stress Management (Case Study)
2. **Exercises on Personality Development Skills**
    - Self-esteem (Case Study)
    - Positive Thinking (Case Study)
    - Emotional Intelligence (Case Study)
    - Team building and Leadership Skills (Case Study)
    - Conflict Management (Case Study)
3. **Exercises on Presentation Skills**

- Netiquette
- Importance of Oral Presentation – Defining Purpose- Analyzing the audience- Planning Outline and Preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals
- One Minute Presentations (Warming up)
- PPT on Project Work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

4. Exercises on Professional Etiquette and Communication

- Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement….etc.
- Telephone Etiquette
- Active Listening
- Group Discussions (Case study)- Group Discussion as a part of Selection Procedure- Checklist of GDs
- Analysis of Selected Interviews (Objectives of Interview)
- Mock-Interviews (Practice Sessions)
- Job Application and Preparing Resume
- Process Writing (Technical Vocabulary) – Writing a Project Report- Assignments

5. Exercises on Ethics and Values

Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts

- Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)
- Attitude, Good Manners and Work Culture (Live Examples)
- Social Skills - Dealing with the Challenged (Live Examples)
- Professional Responsibility – Adaptability (Live Examples)
- Corporate Expectations

☞ Note: Hand-outs are to be prepared and given to students.

☞ Training plan will be integrated in the syllabus.

☞ Topics mentioned in the syllabus are activity-based.

SUGGESTED SOFTWARE:

☞ The following software from **'train2success.com'**

- Preparing for being Interviewed
- Positive Thinking
- Interviewing Skills
- Telephone Skills
- Time Management
- Team Building
- Decision making

SUGGESTED READING

1. Alex, K. 2012. *Soft Skills.* S. Chand Publishers
2. Naterop, B. Jean and Revell, Rod. 2004. *Telephoning in English*. Cambridge: CUP
3. Patnaik, P. 2011. *Group Discussion and Interview Skills.* New Delhi: Foundation
4. Rizvi, M. A. 2005. *Effective Technical Communication.* New Delhi: Tata McGraw Hill
5. Sasikumar, V & Dhamija, P.V. 1993. *Spoken English - A Self-Learning Guide to Conversation Practice.* New Delhi: Tata McGraw-Hill
6. Sudhir Andrews. 2009. *How to Succeed at Interviews.* New Delhi: Tata McGraw Hill
7. Vivekananda: His Call to the Nation : a Compilation R.K. Math Publication

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2A14

STRESS MANAGEMENT BY YOGA
(AUDIT-2)

Course Objectives :
1. To achieve overall health of body and mind
2. To overcome stress

UNIT - I
Definitions of Eight parts of yog. (Ashtanga)

UNIT - II
Yam and Niyam.
Do`s and Don't's in life.
a) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT - III
Asan and Pranayam
b) Various yog poses and their benefits for mind & body
ii)Regularization of breathing techniques and its effects-Types of pranayam

Suggested Reading:

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2A15

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT-2)

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the
6. huge knowledge from ancient literature

UNIT - I

Alphabets in Sanskrit,
Past/Present/Future Tense
Simple Sentences

UNIT - II

Order
Introduction of roots
Technical information about Sanskrit Literature

UNIT - III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Suggested Reading:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
I YEAR II SEMESTER

CN2A16

RESEARCH METHODOLOGY
(AUDIT-2)

Unit-I

Introduction:
Objectives of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research, Ethics in Research.
Research Formulation and Literature Review:
Problem Definition and Formulation; Literature Review; Characteristics of a Good Research Question; Literature Review Process.

Unit-II

Data Collection:
Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data.
Basic Statistical Measures:
Types of Scales; Measures of Central Tendency; Skewness; Measure of Variation; Probability Distribution.

Unit-III

Data Analysis:
Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Sampling.
Research Design:
Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction.

Unit-IV

Hypothesis Formulation and Testing:
Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; f-Test; Making a Decision: Types of Errors; ROC Graphics.
Test Procedures:
Parametric and Non-parametric Tests; ANOVA; Mann-Whitney Test; Kruskal-Wallis Test; Chi-Square Test; Multi-Variate Analysis.

Unit-V

Models for Science and Business:
Algorithmic Research; Methods of Scientific Research; Modelling; Simulations; Industrial Research.
Presentation of the Research Work:
Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

Text Book:

1. Research Methodology - Pearson Publications – S.S. Vinod Chandra; S. Anand Hareendran

Reference Books:

1. Research Methodology - David V. Thiel
2. Research Methodology - R. Panner Selvam

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3E11

BLOCKCHAIN TECHNOLOGY
(ELECTIVE – 5)

Objectives:

- Familiarise the functional/operational aspects of cryptocurrency ECOSYSTEM.
- Understand emerging abstract models for Blockchain Technology.
- Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain

UNIT 1 : The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) .

UNIT 2: cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography
UNIT 3 : Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.
UNIT 4 : Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts

UNIT 5: (Trends and Topics) - Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)

Reference Books

1. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}.
2. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048) . (serious beginning of discussions related to formal models for bitcoin protocols).
3. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles).
4. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3E12

TCP/IP PROTOCOL SUITE
(ELECTIVE-5)

Objectives:

- To Describe how the TCP/IP protocol suite works
- To Describe the functions of static and dynamic IP addresses
- To Explain the major functions of networks with the OSI seven-layer model
- To Describe the major functions of networks with the TCP/IP model

UNIT - I
Introduction to TCP/IP, The OSI Model and TCP/IP Protocol Suites, Underlying Technologies; IP Addressing, Sub netting and Super netting, CIDR, Delivery and Routing of IP Packets

UNIT - II
Internet Protocol (IP), ARP and RARP, Internet Control Message Protocol (ICMP), Internet Group Management Protocol (IGMP)

UNIT - III
User Datagram Protocol (UDP), Transmission Control Protocol (TCP) ; Routing Protocols (RIP, OSPF, HELLO and BGP)

UNIT - IV
Application Layer and Client-Server Model, BOOTP and DHCP; Domain Name System (DNS), Telnet and Rlogin

UNIT - V
File Transfer Protocol (FTP), Trivial File Transfer Protocol (SMTP), Simple Network Management Protocol (SNMP), Hyper Text Transfer Protocol (HTTP)

TEXT BOOKS:

1. "Internetworking with TCP/IP, Principles, Protocols and Architectures", Vol. I, Douglas E.Comer, Fourth Edition, PHI.
2. "TCP/IP Protocol Suite", Forouzan BA, TMH (2000)

REFERENCES:

1. TCP/IP Unleashed, Pearson Education.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3E13

INTRUSION DETECTION AND PREVENTION SYSTEMS
(ELECTIVE – 5)

Course Objectives:

- To understand about the intruders.
- To know the intrusion detection and prevention policies

UNIT- I

INTRODUCTION: Understanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anamoly detection – specification based detection – hybrid detection THEORETICAL FOUNDATIONS OF DETECTION: Taxonomy of anomaly detection system – fuzzy logic – Bayes theory – Artificial Neural networks – Support vector machine – Evolutionary computation – Association rules – Clustering

UNIT- II :ARCHITECTURE AND IMPLEMENTATION: Centralized – Distributed – Cooperative Intrusion Detection - Tiered architecture

UNIT- III :JUSTIFYING INTRUSION DETECTION: Intrusion detection in security – Threat Briefing – Quantifying risk – Return on Investment (ROI)

UNIT- IV:APPLICATIONS AND TOOLS: Tool Selection and Acquisition Process - Bro Intrusion Detection – Prelude Intrusion Detection - Cisco Security IDS - Snorts Intrusion Detection – NFR security

UNIT- V:LEGAL ISSUES AND ORGANIZATIONS STANDARDS: Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.

REFERENCES:

1. Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
2. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
3. Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall , 2001.
4. Ankit Fadia and Mnu Zacharia, "Intrusiion Alert", Vikas Publishing house Pvt., Ltd, 2007.
5. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3E14

NETWORK DESIGN
(ELECTIVE – 5)

UNIT-I
Switching technologies, multiplexing, circuit switching, packet switching X.25, frame relax, SMDs ATM, B-ISDN, traffic matrix, traffic pattern calculations, performance issues of packet networks, delay, availability and reliability

UNIT-II
Network Design for Access: Campus network design, leased line and radio modems, DDR & ISDN Access Network design, X.25 remote access network design, Frame-relay interfaces & traffic shaping VSAT & WLAN network design. Scaling access networks.

UNIT-III
Network Design for Backbone: Identification & selection of internetworking devices, CISCO routers & Nortel switches, EIGRP

UNIT-IV
Network Design for convergence: UDP broadcasts, IP Networks for Voice, Data, Video, Fax, Soft & hard design examples for IP Technology networks, network design for digital video broadcast

UNIT-V
Data Network Management Systems: Managing IP, ICMP, TCP, UDP, X.25 reporting Ethernet traffic, managing bridges & routers. Microsoft & HP, NMS Tools.
Case Studies: selected from design, architecture & topology areas of internetworks.

Reference Books

1. Data Network Design; D L Spolin, Mc-Graw Hill, 1993
2. SNMP "Feit" Mc-Graw Hill Inc., 1995
3. Network Design & Case Studies "CISCO Systems Inc." , CISCO Press, 1993

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3E15

CLOUD SECURITY
(ELECTIVE – 5)

OBJECTIVES:

- Understand the fundamentals of cloud computing.
- Understand the requirements for an application to be deployed in a cloud. 3. Become knowledgeable in the methods to secure cloud.

UNIT – I

CLOUD COMPUTING FUNDAMENTALS: 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.

UNIT – II

CLOUD APPLICATIONS: Technologies and the processes required when deploying web services-Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages- Development environments for service development; Amazon, Azure, Google App.

UNIT – III

SECURING THE CLOUD: Security Concepts - Confidentiality, privacy, integrity, authentication, nonrepudiation, availability, access control, defence in depth, least privilege- how these concepts apply in the cloud and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud

UNIT - IV

VIRTUALIZATION SECURITY: Multi-tenancy Issues: Isolation of users/VMs from each other- How the cloud provider can provide this- Virtualization System Security Issues: e.g. ESX and ESXi Security, ESX file system security- storage considerations, backup and recovery- Virtualization System Vulnerabilities.

UNIT - V

CLOUD SECURITY MANAGEMENT: Security management in the cloud – security management standards- SaaS, PaaS, IaaS availability management- access control- Data security and storage in cloud.

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”, Tata McGraw-Hill Osborne Media; 1 edition 22, [ISBN: 0071626948], 2009.
3. 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.
4. Ronald L. Krutz, Russell Dean Vines, “Cloud Security”, Wiley [ISBN: 0470589876], , 2010.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3O11

IMAGE PROCESSING AND PATTERN RECOGNITION
(OPEN ELECTIVE-1)

UNIT – I

Fundamental steps of image processing, components of an image processing of system. The image model and image acquisition, sampling and quantization, relationship between pixels, distance functions, scanner.

UNIT – II

Statistical and spatial operations, Intensity functions transformations, histogram processing, smoothing & sharpening – spatial filters Frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering, FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation. Morphological and other area operations, basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images.

UNIT- III

Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, regionbased segmentation, segmentation by morphological watersheds.Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding, Digital Image Water marking.

UNIT –IV

Representation and Description Chain codes, Ploygonal approximation, Signature Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors

UNIT V

Pattern Recognition Fundamentals: Basic Concepts of pattern recognition, Fundamental problems in pattern recognition system,design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model

Pattern classification: Pattern classification by distance function: Measures of similarity, Clustering criteria, K-means algorithm, Pattern classification by likelihood function: Pattern classification as a Statistical decision problem, Bayes classifier for normal patterns.

TEXT BOOKS :

1. Digital Image Processing Third edition, Pearson Education,Rafael C. Gonzalez, Richard E. Woods
2. Pattern recognition Principles: Julus T. Tou, and Rafel C. Gonzalez, Addision-Wesly Publishing Company

REFERENCES:

1. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, Vaclav Hlavac and Roger Boyle,Cengage learning.
2. Digital Image Processing,W.K.Pratt,4th editionJohn wiley&sons.
3. Fundamentals of digital image processing ,A.K. Jain,PHI
4. Pattern classification, Richard Duda, Hart and David strok John Weily publishers.
5. Digital Image Processing,S.Jayaraman,S.Esakkirajan,T.Veerakumar,TMH.
6. Pattern Recognition,R.Shinghal,Oxford University Press.
7. Digital Image Processing,S.Sridhar,Oxford University Press.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3O12

NETWORK PROGRAMMING
(OPEN ELECTIVE-1)

Objectives:

- To understand Linux utilities
- To understand file handling, signals
- To understand IPC, network programming in Java
- To understand processes to communicate with each other across a Computer Network.

UNIT – I

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT - II

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT – III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.Message Queues- Kernel support for messages, UNIX system V APIs for messages,

client/server example.Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT – IV

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

UNIT-V

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

TEXT BOOKS:

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
5. Java Network Programming,3rd edition, E.R. Harold, SPD, O'Reilly.(Unit V)

REFERENCES:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.
4. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3O13

BIOMETRICS
(OPEN ELECTIVE-1)

Objectives:
To learn the biometric technologies
To learn the computational methods involved in the biometric systems.
To learn methods for evaluation of the reliability and quality of the biometric systems.

UNIT – I

INTRODUCTION & HANDWRITTEN CHARACTER RECOGNITIONIntroduction – history – type of Biometrics – General Architecture of Biometric Systems – Basic Working of biometric Matching – Biometric System Error and performance Measures – Design of Biometric Systems – Applications of Biometrics – Benefits of Biometrics Versus Traditional Authentication Methods – character Recognition – System Overview – Geature Extraction for character Recognition – Neura; Network for handwritten Charater Recognition – Multilayer Neural Network for Handwritten Character Recognition – Devanagari Numeral Recognition – Isolated Handwritten Devanagari Charater Recognition suing Fourier Descriptor and Hidden markov Model.

UNIT – II

FACE BIOMETRICS & RETINA AND IRIS BIOMETRICSIntroduction –Background of Face Recognition – Design of Face Recognition System – Neural Network for Face Recognition – Face Detection in Video Sequences – Challenges in Face Biometrices – Face Recognition Methods – Advantages and Disadvantages – Performance of Biometrics – Design of Retina Biometrics – Iris Segmentation Method – Determination of Iris Region – Experimental Results of Iris Localization – Applications of Iris Biometrics – Advantages and Disadvantages. VEIN AND FINGERPRINT BIOMETRICS & BIOMETRIC HAND GESTURE RECOGNITION FOR INDIAN SIGN LANGUAGE. Biometrics Using Vein Pattern of Palm – Fingerprint Biometrics – Fingerprint Recognition System – Minutiae Extraction – Fingerprint Indexing – Experimental Results – Advantages and Disadvantages – Basics of Hand Geometry – Sign Language – Indian Sign Language – SIFT Algorithms- Practical Approach Advantages and Disadvantages.

UNIT –III

PRIVACY ENHANCEMENT USING BIOMETRICS & BIOMETRIC CRYPTOGRAPHY AND MULTIMODAL BIOMETRICS

Introduction – Privacy Concerns Associated with Biometric Developments – Identity and Privacy – Privacy Concerns – Biometrics with Privacy Enhancement – Comparison of Various Biometrics in Terms of Privacy – Soft Biometrics - Introduction to Biometric Cryptography – General Purpose Cryptosystem – Modern Cryptography and Attacks – Symmetric Key Ciphers –

Cryptographic Algorithms – Introduction to Multimodal Biometrics – Basic Architecture of Multimodal Biometrics – Multimodal Biometrics Using Face and Ear – Characteristics and Advantages of Multimodal Biometrics Characters – AADHAAR : An Application of Multimodal Biometrics.

UNIT – IV

WATERMARKING TECHNIQUES & BIOMETRICS : SCOPE AND FUTURE

Introduction – Data Hiding Methods – Basic Framework of Watermarking – Classification of Watermarking – Applications of Watermarking – Attacks on Watermarks – Performance Evaluation – Characteristics of Watermarks – General Watermarking Process – Image Watermarking Techniques – Watermarking Algorithm – Experimental Results – Effect of Attacks on Watermarking Techniques – Scope and Future Market of Biometrics – Biometric Technologies – Applications of Biometrics -Biometrics – and Information Technology Infrastructure – Role of Biometrics in Enterprise Security – Role of Biometrics in Border Security – Smart Card Technology and Biometric – Radio Frequency Identification Biometrics – DNA Biometrics – Comparative Study of Various Biometrics Techniques.

UNIT – V

IMAGE ENHANCEMENT TECHNIQUES & BIOMETRICS STANDS

Introduction – current Research in image Enhancement Techniques – Image Enhancement – Frequency Domain Filters – Databases and Implementation – Standard Development Organizations – Application Programming Interface – Information Security and Biometric Standards – Biometric Template Interoperability.

TEXT BOOKS:

1. BIOMETRICS: CONCEPTS AND APPLICATIONS by G R SINHA and SANDEEP B. PATIL, Wiely, 2013.
2. Biometrics for Network Security – Paul Reid, Pearson Education.

REFERENCES:

1. Biometrics – Identity verification in a networked world – Samir Nanavathi, Micheal Thieme, Raj Nanavathi, Wiley – dream Tech.
2. Biometrics – The Ultimate Reference – John D. Woodward, Jr.Wiley Dreamtech.

MASTER OF TECHNOLOGY
(COMPUTER NETWORKS & INFORMATION SECURITY)
II YEAR I SEMESTER

CN3O14

CYBER SECURITY
(OPEN ELECTIVE-1)

Objectives:

To learn about cyber crimes and how they are planned
To learn the vulnerabilities of mobile and wireless devices
To learn about the crimes in mobile and wireless devices

UNIT-I

Introduction to Cybercrime: Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT-II

Cyber offenses: How criminals Plan Them Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Passwaord Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks

UNIT V

Understanding Computer Forensics Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques,Forensics Auditing

TEXT BOOKS:

1. **Cyber Security**: *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. **Introduction to Cyber Security** , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

REFERENCES

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

MASTER OF TECHNOLOGY
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II YEAR I SEMESTER

CN3O15

NATURAL LANGUAGE PROCESSING
(OPEN ELECTIVE-1)

Objectives:

- To acquire basic understanding of linguistic concepts and natural language complexity, variability.
- To acquire basic understanding of machine learning techniques as applied to language.
- To implement N-grams Models.

UNIT I

Introduction and Overview What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. Regular Expressions Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools. Programming in Python An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit) String Edit Distance and Alignment Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT II

Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions Non-probabilistic Parsing Efficient CFG parsing with CYK, another dynamic programming algorithms. Early parser. Designing a little grammar, and parsing with it on some test data. Probability Introduction to probability theory Joint and conditional probability, marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language. Information Theory The "Shannon game"--motivated by language! Entropy, crossentropy, information gain. Its application to some language phenomena.

UNIT III

Language modeling and Naive Bayes Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

UNIT IV

Probabilistic Context Free Grammars Weighted context free grammars. Weighted CYK. Pruning and beam search. Parsing with PCFGs A tree bank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers. Maximum Entropy Classifiers The maximum entropy principle and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks

UNIT V

Maximum Entropy Markov Models & Conditional Random Fields Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP. Lexical Semantics Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing All for multinomial's Information Extraction & Reference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for co reference.

TEXT BOOKS:

1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall

2. "Statistical Natural Language Processing"- Manning and Schutze, MIT Press

3. "Natural Language Understanding". James Allen. The Benajmins/Cummings Publishing Company REFERENCES BOOKS:

1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.

2. Charniak, E.: Statistical Language Learning. The MIT Press.

3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press. 4. Lutz and Ascher - "Learning Python", O'Reilly

MASTER OF TECHNOLOGY
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II YEAR I SEMESTER

CN3O16

COMPUTER VISION
(OPEN ELECTIVE-1)

OBJECTIVES:

To review image processing techniques for computer vision
To understand shape and region analysis
To understand Hough Transform and its applications to detect lines, circles, ellipses
To understand three-dimensional image analysis techniques
To understand motion analysis
To study some applications of computer vision algorithms

UNIT I

IMAGE PROCESSING FOUNDATIONS Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT II

SHAPES AND REGIONS Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT III

HOUGH TRANSFORM Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

UNIT IV

3D VISION AND MOTION Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

UNIT V

APPLICATIONS Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait
analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road
signs – locating pedestrians

REFERENCES:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
4. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
5. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
6. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

MASTER OF TECHNOLOGY
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II YEAR I SEMESTER

CN3O17

CYBER LAWS AND ETHICS
(OPEN ELECTIVE-1)

UNIT - I

Cyber laws and rights in today's digital age; IT Act, Intellectual Property Issues connected with use and management of Digital Data

UNIT - II

The similar Acts of other countries Information Warfare: Nature of information warfare, including computer crime and information terrorism;

UNIT - III

Threats to information resources, including military and economic espionage, communications eavesdropping, computer break-ins, denial-of-service, destruction and modification of data, distortion and fabrication of information, forgery, control and disruption of information How, electronic bombs, and sops and perception management.

UNIT - IV

Countermeasures, including authentication, encryption, auditing, monitoring, intrusion election, and firewalls, and the limitations of those countermeasures.

UNIT - V

Cyberspace law and law enforcement, information warfare and the military, and intelligence in the information age. Information warfare policy and ethical Issues.

References:

1.Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001

2.Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd.