



## **MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

**(Autonomous Institution – UGC, Govt. of India)**

**Sponsored by CMR Educational Society**

(Affiliated to JNTU, Hyderabad, Approved by AICTE - Accredited by NBA & NAAC – 'A' Grade - ISO 9001:2015 Certified)

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# **BACHELOR OF TECHNOLOGY COMPUTER SCIENCE AND ENGINEERING**

## **ACADEMIC REGULATIONS COURSE STRUCTURE AND SYLLABUS (Batches admitted from the academic year 2015 - 2016)**

*Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already pursuing the program) as may be decided by the Academic Council.*

## PRELIMINARY DEFINITIONS AND NOMENCLATURES

- "Autonomous Institution /College" means an institution/college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.
- "Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.
- "Commission" means University Grants Commission.
- "AICTE" means All India Council for Technical Education.
- "University" the Jawaharlal Nehru Technological University, Hyderabad.
- "College" means Malla Reddy College of Engineering & Technology, Secunderabad unless indicated otherwise by the context.
- "Program" means:
  - Bachelor of Technology (B.Tech) degree program
  - UG Degree Program: B.Tech
- "Branch" means specialization in a program like B.Tech degree program in Electronics & Communication Engineering, B.Tech degree program in Computer Science and Engineering etc.
- "Course" or "Subject" means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester.
- T–Tutorial, P–Practical, D–Drawing, L–Theory, C–Credits

## FOREWORD

The autonomy is conferred on Malla Reddy College of Engineering & Technology (MRCET) by UGC based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

Malla Reddy College of Engineering & Technology (MRCET) is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, and also improving upon the values and beliefs for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several experts drawn from academics, industry and research, in accordance with the vision and mission of the college which reflects the mindset of the institution in order to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and brighter prospects of engineering graduates.

***“A thought beyond the horizons of success committed for educational excellence”***

**PRINCIPAL**

**ACADEMIC REGULATIONS FOR B. TECH. (REGULAR)**

**Applicable for the students of B. Tech. (Regular) from the Academic Year 2015-16 and onwards**

**1. Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.

1.2 After eight academic years of course of study, the candidate is permitted to write the examinations for two more years.

1.3 The candidate shall register for **192 credits** and secure **192 credits** with compulsory subjects as listed in Table-1

**Table 1: Compulsory Subjects**

<b>S.No</b>	<b>Subject Particulars</b>
1	All practical Subjects
2	Mini Project
3	Technical Seminar
4	Project Work

1.4 In addition to 1.3, the candidate has to register for Mandatory courses (Non-credit course), 50% of scoring is required for the award of the degree.

2. The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

**3. Courses of study**

The following courses of study are offered at present as specializations for the B. Tech. Course:

<b>S.No</b>	<b>Department</b>
01	Aeronautical Engineering
02	Computer Science Engineering
03	Electronics & Communication Engineering
04	Information Technology
05	Mechanical Engineering
06	Mining Engineering

**4. Credits**

Particulars	Semester	
	Periods per week	Credits
Theory	05	04
	04	03
Practical	03	02
Drawing	03	02
	06	04
Mini Project	--	04
Technical Seminar	06	02
Major Project	15	10

**\*Duration of each period is 50 minutes.**

**5. Distribution and Weightage of Marks**

5.1 The performance of a student in each semester shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, Mini Project, Technical seminar and Major Project work shall be evaluated for 100, 50 and 300 marks, respectively.

5.2 For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

5.3 For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid-term examination consists of a descriptive paper and assignment. The descriptive paper shall be for 20 marks with a total duration of 2 hours. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. While the first mid-term examination shall be conducted from 1 to 2 units of the syllabus, the second mid-term examination shall be conducted from 3 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate.

However, if any student is absent/scoring internal marks less than 40% in any subject of a mid-term examination he/she will be given a chance to write the internal exam once again after he/she re-registering for the internal exam in the concerned subject and paying stipulated fees as per the norms.

The end examination will be conducted for 75 marks with Part A as a compulsory question for 25 marks. Part B is for maximum of 50 marks with 5 questions consisting of two parts each (a) and (b), out of which the student has to answer either (a) or (b), not both. Each question in Part B carries 10 marks.

5.4 For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the College.

5.5 For the subject having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and Estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end semester examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests.

5.6 There shall be a Mini Project to be taken up during the vacation after III year II Semester examination. However, the Mini-Project and its report shall be evaluated along with the Major Project work in IV year II Semester. The Mini Project shall be submitted in a report form and presented before the committee. It shall be evaluated for 100 marks. The committee consists of an External Examiner, Head of the Department, and the Supervisor of the Mini Project and a Senior Faculty member of the department. There shall be no internal marks for Mini Project.

5.7 There shall be a Technical Seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.

5.8 Out of a total of 300 marks for the Major Project work, 100 marks shall be allotted for Internal Evaluation and 200 marks for the End Semester Examination (Viva Voce). The End Semester Examination of the Major Project work shall be conducted by the same committee as appointed for the mini-project. In addition, the project supervisor shall also be included in the committee. The topics for mini project, seminar and project work shall be different from one another. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

5.9 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the college wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to Academic Council. The Academic Council will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Academic Council are final and binding. The laboratory records and internal test papers shall be preserved in the College as per the Affiliation University rules and produced before the Committees/Academic Council as and when asked for.

## **6. Attendance Requirements**

6.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

6.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1 year may be granted by the College Academic Committee

**6.3 Shortage of Attendance below 65% in aggregate shall not be condoned.**

6.4 A student who is short of attendance in semester may seek re-admission into that semester when offered within 4 weeks from the date of the commencement of class work.

**6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class and their registration stands cancelled.**

6.6 A stipulated fee as determined by the examination branch shall be payable towards condonation of shortage of attendance.

**6.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester, as applicable, including the days of attendance in sports, games, NCC and NSS activities.**

**6.8 If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.**

## **7. Course Registration:**

7.1 Every student has to register for a set of Courses in each Semester, with the total number of their Credits being limited by considering the permissible weekly Contact Hours (typically: 30/Week); For this, an average Course Registration of minimum 20 Credits/Semester (e.g., 6-7 Courses) and a maximum of 28 credits are generally acceptable on recommendation of concerned academic advisor by satisfying the pre-requisite conditions.

7.2 Approval of the Course Registration will be informed by the concerned Head of the Department on the beginning of the semester by taking the number of students registered (minimum **one-third** students per class) and availability of the faculty into consideration.

7.3 Dropping of the Course Registration can be permitted up to two weeks from the commencement of the semester. Thereafter no droppings are permitted.

7.4 Interchanging of Course Registrations are not permitted.

7.5 The Pre-requisite conditions for the additional course(s) registration by the students are based on the slots available in the Time Table, Class rooms and Faculty availability.

## **8. Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6.

8.1 A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

8.2 A student shall be promoted from I year to II year upon fulfilling the minimum required attendance.

8.3 A student will be eligible to be promoted from II year to III year, upon fulfilling the academic requirements of 50 % credits up to II year I semester examinations and secures prescribed minimum attendance in II year.

8.4 A student will be eligible to be promoted from III year to IV year, upon fulfilling the academic requirements of 50 % credits up to III year I semester examinations and secures prescribed minimum attendance in III year.

8.5 A student shall register and put up minimum attendance in all 192 credits and shall earn a minimum of 184 credits for the award of B.Tech degree. Further, marks obtained in the 184 credits shall be considered for the calculation of percentage of marks as well as overall CGPA.

8.6 Students who fail to earn 184 credits as indicated in the course structure within ten academic years (8 years of study + 2 years additionally for appearing for exams only) from the year of their admission, shall forfeit their seat in B.Tech course and their admission stands cancelled.

## **9. Course pattern**

9.1 The entire course of study is for four academic years. I,II, III and IV years shall be on semester pattern.

9.2 A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject during the period of supplementary exams.

9.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the next semester. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

## **10. Award of Class**

In assessing the performance of the students in examinations, the usual approach is to award marks based on the examinations conducted at various stages (sessional, mid-term, end-semester etc.,) in a semester. As per UGC Autonomous guidelines, the following system is implemented in awarding the grades and CGPA under the **Choice Based Credit System (CBCS)**.



**Letter Grades and Grade Points:**

The UGC recommends a 10-point grading system with the following letter grades as given below:

Grades	Points	Marks secured (%)
O (Outstanding)	10	≥ 90
A+(Excellent)	9	85 – 89
A(Very Good)	8	75 – 84
B+(Good)	7	70 – 74
B(Above Average)	6	60 – 69
C(Average)	5	50 – 59
P(Pass)	4	40 – 49
F(Fail)	0	<40
Ab(Absent)	0	-

A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

13.1 A student shall register and put up minimum attendance in all 192 credits and shall earn a minimum of 184 credits for the award of B.Tech degree. Further, marks obtained in the 184 credits shall be considered for the calculation of percentage of marks as well as overall CGPA  $\geq 5.0$ , within 8 academic years from the date of commencement of the first academic year, shall be declared to have **‘qualified’** for the award of the B.Tech. Degree in the chosen branch of Engineering as selected at the time of admission.

13.2 A student who qualifies for the award of the degree as listed in 13.1 shall be placed in the following classes.

13.3 Students with final CGPA (at the end of the under graduate programme)  $\geq 7.50$ , and shall be placed in **‘first class with distinction’**.

13.4 Students with final CGPA (at the end of the under graduate programme)  $\geq 6.50$  but  $< 7.50$ , shall be placed in **‘first class’**.

13.5 Students with final CGPA (at the end of the under graduate programme)  $\geq 5.50$  but  $< 6.50$ , shall be placed in **‘Second class’**.

13.6 All other students who qualify for the award of the degree (as per item 13.1), with final CGPA (at the end of the under graduate programme)  $\geq 5.00$  but  $< 5.50$ , shall be placed in **‘pass class’**.

13.7 A student with final CGPA (at the end of the under graduate programme)  $< 5.00$  will not be eligible for the award of the degree.

13.8 Students fulfilling the conditions listed under item 13.3 alone will be eligible for award of **‘university rank’** and **‘gold medal’**.

**Computation of SGPA and CGPA**

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

$$\text{SGPA (Si)} = \Sigma(\text{Ci} \times \text{Gi}) / \Sigma \text{Ci}$$

where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \Sigma(\text{Ci} \times \text{Si}) / \Sigma \text{Ci}$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

**11 Minimum Instruction Days**

The minimum instruction days for each semester shall be 90days.

12 There shall be no branch transfers after the completion of the admission process.

**13 WITHHOLDING OF RESULTS**

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

**14. TRANSITORY REGULATIONS**

14.1 Discontinued, detained, or failed candidates are eligible for readmission as and when next offered.

14.2 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

14.3 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the MRCET.

**15. General**

15.1 Wherever the words he , him , his , occur in the regulations, they include she , her , hers .

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

15.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

15.4 The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already pursuing the program) as may be decided by the Academic Council.

15.5 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions, have to pass the failed subjects which are equivalent to the subjects of prescribed curriculum of the institute, and also pass the subjects of prescribed curriculum of the institute which the candidates have not studied at the earlier Institution on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of prescribed curriculum of the institute, the candidates have to study those subjects in prescribed curriculum of the institute in spite of the fact that those subjects are repeated.

**MALPRACTICES RULES****DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS**

S.No	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
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

		<p>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.</p>
4.	<p>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.</p>	<p>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</p>

		forfeiture of seat.
5.	Using 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-incharge, 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 students 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 student 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.	Student 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.	

**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.

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## **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

### **PEO1 – ANALYTICAL SKILLS**

1. To facilitate the graduates with the ability to visualize, gather information, articulate, analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.

### **PEO2 – TECHNICAL SKILLS**

2. To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of the technology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.

### **PEO3 – SOFT SKILLS**

3. To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing their career and their life.

### **PEO4 – PROFESSIONAL ETHICS**

4. To facilitate the graduates with the knowledge of professional and ethical responsibilities by paying attention to grooming, being conservative with style, following dress codes, safety codes, and adapting themselves to technological advancements.

## PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design / development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.
12. **Life- long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## COURSE STRUCTURE

### I Year B. Tech (CSE) – I Semester

S.NO	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX.MARKS	
						Int	Ext
1	R15A0001	ENGLISH	3		2	25	75
2	R15A0021	MATHEMATICS-1	5	1	4	25	75
3	R15A0011	ENGINEERING PHYSICS-1	3		2	25	75
4	R15A0013	ENGINEERING CHEMISTRY	4		3	25	75
5	R15A0501	COMPUTER PROGRAMMING WITH C	4		3	25	75
6	R15A0302	ENGINEERING DRAWING	2	3	4	25	75
7	R15A0581	COMPUTER PROGRAMMING LAB	-	3	2	25	50
8	R15A0083	ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB	-	3	2	25	50
9	R15A0081	ENGLISH LANGUAGE COMMUNICATION SKILLS LAB-1	-	3	2	25	50
<b>TOTAL</b>			<b>21</b>	<b>13</b>	<b>24</b>	<b>225</b>	<b>600</b>

### I Year B. Tech (CSE) – II Semester

S.NO	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX.MARKS	
						Int	Ext
1	R15A0002	PROFESSIONAL ENGLISH	3		2	25	75
2	R15A0022	MATHEMATICS-II	5	1	4	25	75
3	R15A0012	ENGINEERING PHYSICS-II	3		2	25	75
4	R15A0502	OBJECT ORIENTED PROGRAMMING	4	1	3	25	75
5	R15A0201	ELECTRICAL CIRCUITS	5	-	4	25	75
6	R15A0014	ENVIRONMENTAL STUDIES	4		3	25	75
7	R15A0582	OBJECT ORIENTED PROGRAMMING LAB	-	3	2	25	50
8	R15A0084	IT WORKSHOP/ENGINEERING WORKSHOP	-	3	2	25	50
9	R15A0082	ENGLISH LANGUAGE COMMUNICATION SKILLS LAB - II	-	3	2	25	50
*10	R15A0003	HUMAN VALUES AND SOCIETAL PERSPECTIVES	2	-	-	50	-
<b>TOTAL</b>			<b>26</b>	<b>11</b>	<b>24</b>	<b>275</b>	<b>600</b>

**\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree**

## II Year B. Tech (CSE) – I Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A0503	Mathematical Foundation of Computer Science	4	1	3	25	75
2	R15A0504	Data Structures using C++	5	-	4	25	75
3	R15A0505	Principles of Programming Languages	4	-	3	25	75
4	R15A0024	Probability and Statistics	5	-	4	25	75
5	R15A0401	Electronic Devices and Circuits	4	1	3	25	75
6	R15A0461 R15A0419 R15A0418	Open Elective 1 1. Digital Logic Design 2. Data Communication 3. Optical Communication	4	-	3	25	75
7	R15A0282	Electrical & Electronics lab	-	3	2	25	50
8	R15A0583	Data Structures using C++ Lab	-	3	2	25	50
*9	R15A0004/ R150005	Foreign Language : French/German	2	-	-	50	
<b>Total</b>			<b>28</b>	<b>8</b>	<b>24</b>	<b>250</b>	<b>550</b>

\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

## II Year B. Tech (CSE) – II Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A0506	Formal Language and Automata Theory	4	1	3	25	75
2	R15A0507	Java Programming	4	1	3	25	75
3	R15A0508	Design and Analysis of Algorithms	4	-	3	25	75
4	R15A0509	Database Management Systems	4	1	3	25	75
5	R15A0510	Computer Organization	4	-	3	25	75
6	R15A0061 R15A0062 R15A0063	Open Elective 2: 1. Managerial Economics and Financial Analysis 2. Supply Chain Management 3. Knowledge Management	4		3	25	75
7	R15A0584	Database Management Systems Lab	-	3	2	25	50
8	R15A0585	Java Programming Lab	-	3	2	25	50
9	R15A0006	Gender Sensitization	-	3	2	75	
<b>Total</b>			<b>24</b>	<b>12</b>	<b>24</b>	<b>275</b>	<b>550</b>

## III Year B. Tech (CSE) – I Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A0511	Software Engineering	4	1	3	25	75
2	R15A0512	Compiler Design	5	-	4	25	75
3	R15A0513	Operating Systems	5	-	4	25	75
4	R15A0514	Computer Networks	4	1	3	25	75
5	R15A0515 R15A0516 R15A0517	Core Elective 1 1. Advanced Computer Architecture 2. Distributed Data Bases 3. Computer Graphics	4	-	3	25	75
6	R15A0064 R15A0065 R15A0069	Open Elective 3 1. Enterprise Resource Planning 2. Management Science 3. Intellectual Property Rights	4	-	3	25	75
7	R15A0586	Compiler Design Lab	-	3	2	25	50
8	R15A0587	Computer Networks & Operating Systems Lab	-	3	2	25	50
9	R15A0007	Technical Communication and Soft Skills	-	2	-	50	-
<b>Total</b>			<b>26</b>	<b>10</b>	<b>24</b>	<b>250</b>	<b>550</b>

**\*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree**

## III Year B. Tech (CSE) – II Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A0518	Object Oriented Analysis and Design	5	-	4	25	75
2	R15A0519	Information Security	5	-	4	25	75
3	R15A0520	Web Technologies	4	1	3	25	75
4	R15A0521	Software Testing Methodologies	4	1	3	25	75
5	R15A0522 R15A0523 R15A0524 R15A0525	Core Elective 2 1. Information Security Management (security analyst-1) 2. Introduction To Analytics (associate analytics-1) 3. Distributed systems 4. Artificial Intelligence & Neural Networks	4	-	3	25	75
6	R15A0462 R15A0426 R15A0432	Open Elective 4 1. Embedded Systems 2. Digital Image Processing 3. Wireless Communication and Networks	4	-	3	25	75
7	R15A0588	Web Technologies Lab	-	3	2	25	50
8	R15A0589	Case Tools and Software Testing Methodologies Lab	-	3	2	25	50

<b>Total</b>			<b>26</b>	<b>8</b>	<b>24</b>	<b>200</b>	<b>550</b>

**IV Year B. Tech (CSE) – I Semester**

S.No	Subject Code	SUBJECT	L	T/P/D	C	Max. Marks	
						Int	Ext
1	R15A0526	Data Warehousing and Data Mining	5	-	4	25	75
2	R15A0527	LINUX Programming	5	-	4	25	75
3	R15A0528	Design Patterns	4	1	3	25	75
4	R15A0529	Cloud Computing	4	1	3	25	75
5	R15A0530	Core Elective 3	4	-	3	25	75
	R15A0531	1. Information Security Assessments & Audits(Security Analyst-2)					
	R15A0532	2. Big-Data Analytics (Associate Analytics-2)					
	R15A0533	3. Mobile Computing					
6	R15A0534	Core Elective 4	4	-	3	25	75
	R15A0535	1. Parallel Processing					
	R15A0536	2. Semantic Web and Social Networks					
7	R15A0590	3. Internet of Things					
7	R15A0590	Data Warehousing and Data Mining Lab	-	3	2	25	50
8	R15A0591	Linux Programming Lab	-	3	2	25	50
<b>Total</b>			<b>26</b>	<b>8</b>	<b>24</b>	<b>200</b>	<b>550</b>

**IV Year B. Tech (CSE) – II Semester**

S.No	Subject Code	SUBJECT	L	T/P/D	C	Max. Marks	
						Int	Ext
1	R15A0537	Core Elective 5	5	-	4	25	75
	R15A0538	1. Information Security Incident Response and Management (Security Analyst-3)					
	R15A0539	2. Predictive Analytics (Associate Analytics-3)					
	R15A0540	3. Web Services					
2	R15A0541	Core Elective 6	5	-	4	25	75
	R15A0542	1. Scripting Languages					
	R15A0543	2. Storage Area Networks					
3	R15A0596	3. Software Project Management					
3	R15A0596	Mini Project	-	-	4	-	100
4	R15A0597	Technical Seminar	-	6	2	50	-
5	R15A0598	Major Project	15	-	10	100	200
<b>Total</b>			<b>25</b>	<b>6</b>	<b>24</b>	<b>200</b>	<b>450</b>

## MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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### (R15A0511) SOFTWARE ENGINEERING

#### Objectives:

- To understand software process models such as waterfall and evolutionary models.
- To understand software requirements and SRS document.
- To understand different software design and architectural styles.
- To understand software testing approaches such as unit testing and integration testing.
- To understand quality control and how to ensure good quality software through quality assurance.

#### UNIT - I:

**Introduction to Software Engineering:** The evolving role of software, Changing Nature of 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, 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.

**Creating an architectural design:** Software architecture, Data design, Architectural styles and patterns, Architectural Design.

**Object-Oriented Design:** Objects and object classes, An Object-Oriented design process, Design evolution.

**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, 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.

**Risk management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

#### **UNIT - V:**

**Quality Management:** Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

#### **TEXT BOOKS :**

1. Software Engineering A practitioner's Approach, Roger S Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson education.

#### **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 modelling, Diner Bjorner, Springer International edition, 2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition 2006.
7. Software Engineering Foundations, Yingux Wang, Auerbach Publications, 2008.
8. Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, John Wiley & Sons Ltd.
9. Software Engineering3: Domains, Requirements, and Software Design, D. Bjorner, Springer International Edition.
10. Introduction to Software Engineering, R. J. Leach, CRC Press.

#### **Outcomes:**

- Ability to identify the minimum requirements for the development of application.
- Ability to develop, maintain, efficient, reliable and cost effective software solutions.
- Ability to critically thinking and evaluate assumptions and arguments.



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### (R15A0512) COMPILER DESIGN

#### Objectives:

- To provide an initial Understanding of language translators, Knowledge of various techniques used in compiler construction and also use of the automated tools available in compilers construction.

#### UNIT – I:

**Language Translation:** Basics, Necessity, Steps involved in atypical language processing system, Types of translators, **Compilers:** Overview and Phases of a Compiler, Pass and Phases of translation, bootstrapping, data structures in compilation

**Lexical Analysis (Scanning):** Functions of Lexical Analyzer, **Specification of tokens:** Regular expressions and Regular grammars for common PL constructs. **Recognition of Tokens:** Finite Automata in recognition and generation of tokens. **Scanner generators:** LEX-Lexical Analyzer Generators. **Syntax Analysis (Parsing) :** Functions of a parser, Classification of parsers. Context free grammars in syntax specification, benefits and usage in compilers.

#### UNIT – II:

**Top down parsing** –Definition, types of top down parsers: Backtracking, Recursive descent, Predictive, LL (1), Preprocessing the grammars to be used in top down parsing, Error recovery, and Limitations.

**Bottom up parsing:** Definition, types of bottom up parsing, Handle pruning. Shift Reduce parsing, **LR parsers:** LR(0), SLR, CALR and LALR parsing, Error recovery, Handling ambiguous grammar, **Parser generators:** YACC-yet another compiler compiler.

#### UNIT – III:

**Semantic analysis:** Attributed grammars, Syntax directed definition and Translation schemes, Type checker: functions, type expressions, type systems, types of checking of various constructs.

**Intermediate Code Generation:** Functions, different intermediate code forms- syntax tree, DAG, Polish notation, and Three address codes. Translation of different source language constructs into intermediate code.

**Symbol Tables:** Definition, contents, and formats to represent names in a Symbol table. Different approaches used in the symbol table implementation for block structured and non block structured languages, such as Linear Lists, Self Organized Lists, and Binary trees, Hashing based STs.

#### UNIT – IV:

**Runtime Environment:** Introduction, Activation Trees, Activation Records, Control stacks. Runtime storage organization: Static, Stack and Heap storage allocation. Storage allocation for arrays, strings, and records etc.

**Code optimization:** goals and Considerations for Optimization, Scope of Optimization: Local optimizations, DAGs, Loop optimization, Global Optimizations. Common optimization techniques: Folding, Copy propagation, Common Sub expression eliminations, Code motion, Frequency reduction, Strength reduction etc.

**UNIT – V:**

**Control flow and Data flow analysis:** Flow graphs, Data flow equations, global optimization: Redundant sub expression elimination, Induction variable eliminations, Live Variable analysis. **Object code generation:** Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

**TEXT BOOKS:**

1. Compilers, Principle, Techniques, and Tools. – Alfred.V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ullman ; 2<sup>nd</sup> Edition, Pearson Education.
2. Modern Compiler implementation in C , - Andrew N.Appel Cambridge University Press.

**REFERENCES:**

1. **lex & yacc** , -John R Levine, Tony Mason, Doug Brown; O'reilly.
2. **Compiler Construction**,- LOUDEN, Thomson.
3. Engineering a compiler – Cooper & Linda, Elsevier
4. Modern Compiler Design – Dick Grune, Henry E.Bal, Criel TH Jacobs, Wiley Drearetech

**Outcomes:** By the end of the semester, the student will be able to:

- Understand the necessity and types of different language translators in use.
- Apply the techniques and design different components (phases) of a compiler by hand.
- Solve problems, Write Algorithms, Programs and test them for the results.
- Use the tools Lex, Yacc in compiler construction.

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### (R15A0513) OPERATING SYSTEMS

#### Objectives:

- To understand main components of OS and their working
- To study the operations performed by OS as a resource manager
- To understand the different scheduling policies of OS
- To understand the different memory management techniques
- To understand process concurrency and synchronization
- To understand the concepts of input/ output, storage and file management
- To study different OS and compare their features.

#### UNIT - I:

**Operating System Introduction:** Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure, Virtual machines.

#### UNIT - II:

Process and CPU Scheduling - Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Case studies: Linux, Windows.

Process Coordination - Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

#### UNIT - III:

Memory Management and Virtual Memory - Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table. Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement - Page Replacement Algorithms, Allocation of Frames, Thrashing.

#### UNIT - IV:

File System Interface - The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance.

Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management.

**UNIT - V:**

Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

**Protection** - System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

**TEXT BOOKS:**

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

**REFERENCES BOOKS:**

1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhare, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, A. S. Godbole, 2nd Edition, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S. Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
8. Operating Systems in depth, T. W. Doeppner, Wiley.

**Outcomes:**

- Apply optimization techniques for the improvement of system performance.
- Ability to understand the synchronous and asynchronous communication mechanisms in their respective OS.
- Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput with keeping CPU as busy as possible.
- Ability to compare the different OS

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### (R15A0514) COMPUTER NETWORKS

#### Objectives:

- To introduce the fundamental types of computer networks.
- To demonstrate the TCP/IP & OSI model merits & demerits.
- To know the role of various protocols in Networking.

#### UNIT - I:

**Introduction:** Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model, Comparison of the OSI and TCP/IP reference model. Architecture of Internet.

**Physical Layer:** Guided transmission media, Wireless transmission media, Switching

#### UNIT - II:

**Data Link Layer** - Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, Sliding window protocols

**Multiple Access Protocols** - ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision free protocols, Ethernet-Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

#### UNIT - III:

**Network Layer:** Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Link State Routing, Path Vector Routing, Hierarchical Routing; Congestion control algorithms, QOS

IP addresses, CIDR, Subnetting, SuperNetting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ICMP, ARP, RARP, DHCP

#### UNIT - IV:

**Transport Layer:** Services provided to the upper layers elements of transport protocol-addressing connection establishment, Connection release, Error Control & Flow Control, Multiplexing, Crash Recovery.

The Internet Transport Protocols: UDP, RPC, Real Time Transport Protocols, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control,

**UNIT - V:** Application Layer- Introduction, providing services, Applications layer paradigms: Client server model, HTTP, FTP, E-mail, WWW, TELNET, DNS, SSH; RSA algorithm, Network Management: SNMP,

**TEXT BOOKS:**

1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.

**REFERENCES BOOKS:**

1. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education.

**Outcomes:**

- Students should be understand and explore the basics of Computer Networks and Various Protocols. Student will be in a position to understand the World Wide Web concepts.
- Students will be in a position to administrate a network and flow of information further Student can understand easily the concepts of network security, Mobile, and ad hoc networks.

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**(R15A0515) ADVANCED COMPUTER ARCHITECTURE**  
**(Core Elective-I)**
**Objectives:**

- To learn the fundamental aspects of computer architecture design and analysis.
- The course focuses on processor design, pipelining, superscalar, out-of-order execution, caches (memory hierarchies), virtual memory, storage systems, and simulation technique

**Unit – I**

Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.

**Unit – II**

Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler.

**Unit – III**

Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP,ILP software approach- compiler techniques- static branch protection – VLIW approach – H.W support for more ILP at compile time- H.W verses S.W Solutions

**Unit – IV**

Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM. Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

**Unit – V**

Storage systems- Types – Buses – RAID- errors and failures- bench marking a storage device- designing a I/O system. Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster.

**TEXT BOOK:**

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

**REFERENCES:**

1. "Computer Architecture and parallel Processing" Kai Hwang and A. Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.
3. Parallel Computer Architecture, A Hardware / Software Approach, David E. Culler, Jaswinder Pal singh with Anoop Gupta, Elsevier

**Outcomes:**

- Will know about computer performance, instruction set architecture design and implementation
- Will know about and processor implementation alternatives (single- cycle, multiple-cycle, and pipelined implementations)



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### (R15A0516) DISTRIBUTED DATABASES (Core Elective-I)

**Objectives:**

The aim of the course is to

- Enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems;
- Introduce basic principles and implementation techniques of distributed database systems
- Expose active and emerging research issues in distributed database systems and application development
- Apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.

**UNIT – I**

Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels Of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases. Translation of Global Queries to Fragment Queries, Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

**UNIT – II**

Optimization of Access Strategies, a Framework for Query Optimization, Join Queries, General Queries. The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions. Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, and Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

**UNIT –III**

Reliability, Basic Concepts, No blocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection

**UNIT –IV**

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency Object Management, Object Identifier Management, Pointer Sizzling, Object Migration, Distributed Object Storage, Object

Query Processing, Object Query Processor Architectures, Query Processing Issues, query Execution, Transaction Management, Transaction Management in DBMSs, Transactions as Objects.

#### **UNIT –V**

Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues. Transaction Management Transaction and Computation Model Multi database Concurrency Control, Multi database Recovery, Object Orientation And Interoperability Object Management Architecture CORBA and Database Interoperability Distributed Component Model COM/OLE and Database Interoperability, PUSH-Based Technologies

#### **TEXT BOOKS:**

1. Distributed Database Principles & Systems, Stefano Ceri, Giuseppe Pelagatti McGraw-Hill

#### **REFERENCES:**

1. An Introduction to Database Systems, C. J. Date, 8<sup>th</sup> Edition, Addison-Wesley, 2003, PP. 651 - 660

#### **Outcomes:**

After the completion of the course, the students are expected to

- Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services;
- Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case;
- Be aware of the current research directions in the field and their possible outcomes; 4) be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions;
- Be able to apply learned skills in solving practical database related tasks.

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**(R15A0517) COMPUTER GRAPHICS  
(Core Elective-I)****Objectives:**

- To make students understand about fundamentals of Graphics to enable them to design animated scenes for virtual object creations.
- To make the student present the content graphically.

**UNIT-I:**

**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

**Output primitives:** Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms

**UNIT-II:**

**2-D geometrical transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

**2-D viewing :** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm

**UNIT-III:**

**3-D object representation :** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

**3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations. **3-D viewing :** Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

**UNIT-IV:**

**Visible surface detection methods:** Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods

**UNIT-V:**

**Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

**TEXT BOOKS:**

1. "Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

**REFERENCES:**

1. Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education.
2. Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
3. rocedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2<sup>nd</sup> edition.
4. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
5. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
6. Computer Graphics, Steven Harrington, TMH

**Outcomes:**

- Students can animate scenes entertainment.
- Will be able to work in computer aided design for content presentation..
- Better analogy data with pictorial representation.

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### (R15A0064) ENTERPRISE RESOURCE PLANNING (Open Elective-III)

#### Objectives:

- It enables the student to understand the foundations of Enterprise planning and ERP System Options.

#### Unit-I

**Introduction to ERP:** Foundation for Understanding ERP systems-Business benefits of ERP-The challenges of implementing ERP system-ERP modules and Historical Development.

#### Unit-II

**ERP System Options & Selection Methods:** Measurement of project Impact- information Technology Selection-ERP proposal evaluation-Project Evaluation Technique.

#### Unit-III

**ERP System Installation Options:** IS/IT Management results-Risk Identification analysis-System Projects-Demonstration of the system-Failure method-system Architecture & ERP.

#### Unit-IV

**ERP-Sales and Marketing-** Management control process in sales and marketing-ERP customer Relationship Management-ERP systems- Accounting & Finance control processes. Financial modules in ERP systems.

#### Unit-V

**ERP-Production and Material Management-**Control process on production and manufacturing-Production module in ERP- supply chain Management & e-market place-e-businesses & ERP-e supply chain & ERP- Future directions for ERP.

#### TEXT BOOK:

- Mary Sumner "Enterprise Resource Planning" Pearson, 2012.
- David L.Olson "Managerial Issues in ERP systems" TMH 2012.

#### REFERENCES:

- Ellen Monk "Enterprise Resource Planning" Cengage, 2012.
- Alexis Leon "Enterprise Resource Planning" 2<sup>nd</sup> Edition, TMH ,2012
- Goyal "Enterprise Resource Planning" TMH, 2012
- Jagan Nathan Vaman "ERP Strategies for Steering Organizational competence and competitive Advantage" TMH, 2012.
- Rajesh Ray "Enterprise Resource Planning" TMH, 2012
- Jyotindra Zaveri, Enterprise Resource Planning, HPH, 2012.

#### Outcomes:

- The student understands the challenges in implementation of ERP system, ERP System Implementation options, and functional modules of ERP.

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### OPEN ELECTIVE - III (R15A0065) MANAGEMENT SCIENCE

#### OBJECTIVES:

1. This course is intended to familiarize the students with the basic knowledge of Management related concepts, Organization structures, Control charts, Marketing management, Human resource management, Project management, Strategic management in order to achieve the positions of future leaders and managers.

#### Unit-I

**Introduction to Management:** Nature of Management, importance functions of Management, Systems approach to Management, Taylor's scientific Management theory, Fayal's principles of Management, Maslow's need hierarchy theory, McGregor's Theory X and Theory Y, Hertzberg Two Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

#### Unit-II

Organization Structures, Control charts and Marketing Management: Line Organization structure, Line and Staff organization structure, Matrix organization structure, Team Organization structure, Control charts ( $\bar{X}$  chart, R chart, C chart, P chart), EOQ, ABC analysis, Functions of Marketing, Marketing Mix, Marketing strategies based on PLC.

#### Unit-III

**Human Resource Management:** Importance of HRM, HRM Vs PMIR (Personnel Management and Industrial Relations), Functions of HR Manager: Man power planning, Recruitment, Selection, Training and Development, Wage and Salary administration, Performance Appraisal, Grievance handling and welfare administration, Job evaluation, and merit rating.

#### Unit-IV

**Project Management(PERT and CPM):** Network analysis, Program Evaluation and Review Technique(PERT), Critical Path Method (CPM), Identifying Critical path, Probability of completing the project within given time, Project cost analysis, Project crashing(simple problems).

#### Unit-V

**Strategic Management:** Vision, Mission, Goals, Objectives, Policy, Strategy, Programs, Corporate planning process, Environmental scanning, SWOT analysis, Steps in strategy formulation and implementation.

**TEXT BOOKS:**

1. Harold Koontz, Heinz Weihrich, A.R.Aryasri, Principles of Management, TMH, 2010.
2. K. Aswathappa, "Human Resource Management, Text and Cases", TMH, 2011.
3. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithleshwar Jha: Marketing Management, 13/e, Pearson Education, 2012.
4. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.

**REFERENCES:**

1. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
2. Gary Dessler, "Human Resource Management", 12 Edition, Pearson- 2012.
3. Rajan Saxena: Marketing Management, 4/e, TMH, 2013
4. Aryasri: Management Science, McGraw Hill, 2012

**OUTCOMES:**

1. To know the basic management practices, functional areas of the organisation which helps the students to build up their career in the corporate world.

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### (R15A0069) INTELLECTUAL PROPERTY RIGHTS (Open Elective-III)

**Objectives:**

- The objective of this course is to provide the knowledge on International IPR's and to make students efficient to take decisions in Global Corporate.

**Unit-I**

**Introduction:** Intellectual property rights basics, the role and value of IP in international commerce, Issues affecting IP internationally. Agreement on trade related aspects of Intellectual Property Rights. (TRIPS) - Agreement on TRIPS and India.

**Unit-II**

**Parties to IP Rights:** Owner, customer, authorized user, licensee, attorney, protection of the weak and strong, finalizing ownership and use rights.

**Unit-III**

**Ensuring the value of IP:** Ensuring the value of IP at creation stage, after creation stage, precise contractual protection of IP rights. Key issues related to IP internationally. IP rights in international forums. Fundamentals in Country legal systems, generalities. Validity of IP rights locally: specifics.

**Unit-IV**

**Managing IP Rights:** Acquiring IP Rights: letters of instruction, joint collaboration agreement, work made for hire agreement - Protecting IP Rights: non disclosure agreement, cease and desist letter, settlement memorandum. Transferring IP Rights: assignment contract, license agreement, deed of assignment or license agreement, addendum to unrecorded assignment or license.

**Unit-V**

**Remedies** and IPR Evaluation - GATT - WTO - Role of WTO in solving IPR issues.

**TEXT BOOKS:**

- A short course in International Intellectual Property Rights – Karla C. Shippey, World Trade Press – 2<sup>nd</sup> Edition.
- Intellectual Property Rights – Heritage, Science, & Society under international treaties – A. Subbian, - Deep & Deep Publications – New Delhi.



**REFERENCES:**

1. Intellectual Property Rights: N K Acharya: ISBN: 9381849309
2. Intellectual Property Rights: C B Raju : ISBN-8183870341
3. Intellectual Property : Examples and Explanation – Stephen M McJohn, 2/e, ISBN-13: 978-0735556652
4. Intellectual Property Rights in the Global Economy – Keith E Maskus, PIIE, ISBN paper 0-88132-282-2

**Outcomes:**

- It allows students how to prepare and protect the Inventions, start up ideas and rights of patents and copy rights etc.,
- This subject brings awareness to the students about the basic legal aspects at present following at Global level.

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### (R15A0586) COMPILER DESIGN LAB

#### Objectives:

- To provide an Understanding of the language translation peculiarities by designing complete translator for an abstract mini language whose syntax by BNF notation in following lines.

#### SOURCE (MINI) LANGUAGE ( A Case Stdudy)

Consider the following mini language, a simple procedural High Level Language, operating on integer data with a syntax looking vaguely like a simple C crossed with Pascal. The syntax of the language is defined by the following BNF grammar:

```

<program> ::= <block>
<block> ::= { <variable definition> <slist> }
           | { <slist> }
<variable definition> ::= int <vardeflist> ;
<vardeflist> ::= <vardec> | <vardec>, <vardeflist>
<vardec> ::= <identifier> | <identifier> [<constant>]
<slist> ::= <statement> | <statement> ; <slist>
<statement> ::= <assignment> | <ifstatement> | <whilestatement> | <block>
               | <printstatement> | <empty>
<assignment> ::= < identifier> = <expression>
               | <identifier> [<expression>] = [<expression>]
<ifstatement> ::= if <bexpression> then <slist> else <slist> endif
               | if <bexpression> then <slist> endif
<whilestatement> ::= while <bexpression> do <slist> enddo
<printstatement> ::= print{ <expression> }
<expression> ::= <expression> <addingop> <term> | <term> | <addingop> <term>
<bexpression> ::= <expression> <relop> <expression>
<relop> ::= < | <= | = = | >= | > | !=
<addingop> ::= + | -
<term> ::= <term> <multop> <factor> | <factor>
<multop> ::= * | /
<factor> ::= <constant> | <identifier> | <identifier> [<expression>]
           | (<expression>)
<constant> ::= <digit> | <digit> <constant>
<identifier> ::= <identifier> <letterordigit> | <letter>

```

<letterordigit> ::= a|b|c|...|y|z

<digit> ::= 0|1|2|3|...|8|9

<empty> ::= has the obvious meaning

Comments : zero or more characters enclosed between the standard C/Java style comment brackets /\*...\*/. The language has the rudimentary support for 1-Dimensional arrays. Ex: int a[3] declares a as an array of 3 elements, referenced as a[0],a[1],a[2].

**Sample Program written in this language is :**

```
{
  int a[3],t1,t2;
  t1=2;
  a[0]=1; a[1]=2; a[t1]=3;
  t2= -(a[2]+t1*6) / a[2]-t1;
  if t2>5 then
    print(t2);
  else
  {
    int t3;
    t3=99;
    t2=25;
    print(-11+t2*t3); /* this is not a comment on two lines */
  }
  endif
}
```

1. Write a C Program to scan and count the number of characters, words, and line of a file.
2. Write a program for implementation of NFAs that recognize identifiers, constants, and operators of the mini language.
3. Write a program for the implementation of DFAs that recognize identifiers, constants, and operators of the mini language.
4. Design a Lexical analyzer for the above language. The lexical analyzer should ignore redundant spaces, tabs and newlines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value.
5. Implement the lexical analyzer using JLex, flex, flex or lex or other lexical analyzer generating tools.
6. Design Predictive parser for the given language.
7. Design LALR bottom up parser for the above language.
8. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree or Three Address code.
9. Write program to generate machine code from the abstract syntax tree generated by the parser. The following instruction set may be considered as target code.

The following is a simple register-based machine, supporting a total of 17 instructions. It has three distinct internal storage areas. The first is the set of 8 registers, used by the individual instructions as detailed below, the second is an area used for the storage of variables and the third is an area used for the storage of program. The instructions can be preceded by a label. This consists of an integer in the range 1 to 9999 and the label is followed by a colon to separate it from the rest of the instruction. The numerical label can be used as the argument to a jump instruction, as detailed below.

In the description of the individual instructions below, instruction argument types are specified as follows:

R specifies a register in the form R0, R1, R2, R3, R4, R5, R6 or R7 (or r0, r1, etc).

L specifies a numerical label (in the range 1 to 9999).

V specifies a "variable location" (a variable number, or a variable location pointed to by a register - see below).

A specifies a constant value, a variable location, a register or a variable location pointed to by a register (an indirect address). Constant values are specified as an integer value, optionally preceded by a minus sign, preceded by a # symbol. An indirect address is specified by an @ followed by a register.

So, for example an A-type argument could have the form 4 (variable number 4), #4 (the constant value 4), r4 (register 4) or @r4 (the contents of register 4 identifies the variable location to be accessed).

The instruction set is defined as follows:

LOAD A, R : Loads the integer value specified by A into register R.

STORE R, V : Stores the value in register R to variable V.

OUT R : Outputs the value in register R.

NEG R : Negates the value in register R.

ADD A, R : Adds the value specified by A to register R, leaving the result in register R.

SUB A, R : Subtracts the value specified by A from register R, leaving the result in register R.

MUL A, R : Multiplies the value specified by A by register R, leaving the result in register R.

DIV A, R : Divides register R by the value specified by A, leaving the result in register R.

JMP L : Causes an unconditional jump to the instruction with the label L.

JEQ R, L : Jumps to the instruction with the label L if the value in register R is zero.

JNE R, L : Jumps to the instruction with the label L if the value in register R is not zero.

JGE R, L : Jumps to the instruction with the label L if the value in register R is greater than or equal to zero.

JGT R, L : Jumps to the instruction with the label L if the value in register R is greater than zero.

JLE R, L : Jumps to the instruction with the label L if the value in register R is less than or equal to zero.

JLT R, L : Jumps to the instruction with the label L if the value in register R is less than zero.

NOP : Is an instruction with no effect. It can be tagged by a label.

STOP : Stops execution of the machine. All programs should terminate by executing a STOP instruction.

#### **RECOMMENDED SYSTEM / SOFTWARE REQUIREMENTS:**

1. Intel based desktop PC with minimum of 166MHz or faster processor with at least 64 MB RAM and 100 MB free disk space.
2. C++ Compiler and JDK kit, Lex or Flex and YACC tools ( Unix/Linux utilities )

**USEFUL TEXT BOOKS / REFERECES / WEBSITES :**

1. Modern compiler implementation in C, Andrew w.Appel, Revised Edn, Cambridge University Press
2. Principles of Compiler Design. – A.V Aho, J.D Ullman ; Pearson Education.
3. **lex&yacc** , -John R Levine, Tony Mason, Doug Brown; O'reilly.
4. **Compiler Construction**, - LOUDEN, Thomson.
5. Engineering a compiler – Cooper& Linda, Elsevier
6. Modern Compiler Design – Dick Grune, Henry E. Bal, Criel TH Jacobs, Wiley Dreatech

**Outcomes:**

By the end of the semester the student will be able to

- Understand the practical approach of how a compiler is designed.
- Apply the techniques used in compiler construction.
- Construct components(few phase) of the compiler for the mini language

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### (R15A0587) COMPUTER NETWORKS & OPERATING SYSTEMS LAB

**Objectives:**

- To understand the functionalities of various layers of OSI model
- To explain the difference between hardware, software; operating systems, programs and files.
- Identify the purpose of different software applications.

**Part A:**

1. Simulate the following CPU scheduling algorithms
 

a) Round Robin	b) SJF	c) FCFS	d) Priority
----------------	--------	---------	-------------
2. Simulate all file allocation strategies
 

a) Sequential	b) Indexed	c) Linked	
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3. Simulate MVT and MFT
4. Simulate all File Organization Techniques
 

a) Single level directory	b) Two level	c) Hierarchical	d) DAG
---------------------------	--------------	-----------------	--------
5. Simulate Bankers Algorithm for Dead Lock Avoidance
6. Simulate Bankers Algorithm for Dead Lock Prevention
7. Simulate all page replacement algorithms
 

a) FIFO	b) LRU	c) LFU	
---------	--------	--------	--
8. Simulate Paging Technique of memory management.

**Part B:**

1. Implement the data link layer framing methods such as character, character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP
3. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using distance vector routing algorithm
5. Take an example subnet of hosts . Obtain broadcast tree for it.
6. Using RSA algorithm Encrypt a text data and Decrypt the same.

**Outcomes:** The student will have the ability to :

- Understand fundamental underlying principles of computer networking.
- Understand details and functionality of layered network architecture.
- Apply mathematical foundations to solve computational problems in computer networking.
- Describe and demonstrate the functions and features of current operating systems
- Demonstrate proficiency in common industry software applications (word processing, spreadsheet, presentation, and database) to effectively communicate in a professional business setting
- Demonstrate skills that meet industry standards and certification requirements in the use of system hardware, operating systems technologies, and application systems

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### (R15A0007) TECHNICAL COMMUNICATION AND SOFT SKILLS

#### INTRODUCTION:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

#### Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to approach academic subjects more professionally using the theoretical and practical components of the English syllabus.
- To develop the professional skills and communication skills in formal and informal situations and hone the required professional ethics.

**Unit- 1:** Factors affecting information and document design, Principles of effective writing, Technical Writing, Grammar and Editing- Technical writing process, Writing drafts and revising, Collaborative writing, technical writing style and language.

**Unit- 2:** Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication.

**Unit-3:** Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids. Writing reports, Email writing, official notes, business letters, memos, progress reports, minutes of meetings, event report.

**Unit- 4:** Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, self esteem.

**Unit- 5:** Ethics- Business ethics, , Personality Development in social and office settings, netiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Rapid reading, Complex problem solving, Creativity, leadership skills, cubicle Etiquettes, team building.

**Text Books:**

1. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

**Reference Books:**

1. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
2. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
3. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

**Outcomes:**

- The student will become proficient in LSRW skills.
- They develop formal LSRW skills approach to different situations.
- They hone professional ethics and learn to be proficient formally.



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### (R15A0518) OBJECT ORIENTED ANALYSIS AND DESIGN

#### Objectives:

- To understand the object oriented life cycle.
- To know how to identify objects, relationships, services and attributes through UML.
- To understand the use-case diagrams.
- To know the Object Oriented Design process.
- To know about software quality and usability

#### UNIT-I

Introduction to UML, Importance of Modeling, Principles of Modeling, Object oriented modeling, Conceptual model of the UML, Architecture of UML, Software Development Life Cycle.

#### UNIT-II

Basic Structural Modeling, Classes, Relationships, Common Mechanisms, Basic Diagrams, Advanced Structural Modeling, Advanced Classes, Advanced Relationships, Interfaces, Types and Roles, Packages. Class and Object Diagrams, Terms, Concepts, Modeling Techniques for Class Diagrams

#### UNIT-III

Basic Behavioral Modeling-I, Interactions, Interaction Diagrams.

Basic behavioral Modeling-II, Usecases, Use case Diagrams, Activity Diagrams.

#### UNIT-IV

Advanced Behavioral Modeling, Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

Architectural Modeling, Component, Deployment, Component Diagrams, Deployment Diagram.

#### UNIT V

Case Study, The Unified Library application.

#### TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

**REFERENCES :**

1. Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modeling Languages User Guide", Addison Wesley, 2004.
2. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw Hill, New Delhi.
3. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.

**Outcomes:**

Upon successful completion of this course, students should be able to:

- Apply fundamental concepts of object-oriented analysis and design approach.
- Understand Unified Modeling Language Notation.
- Apply models for object-oriented system development
- Identify system development design patterns.
- Create use case diagram to represent the scope of development problem domain.
- Develop domain model, sequence diagram, activity diagram and state chart diagram based on use case narrative.
- Apply Unified Modeling Language Notation to object-oriented models.
- Build up experience on adopting object-oriented approach as an alternative methodology for system development.

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### (R15A0519) INFORMATION SECURITY

#### Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

#### UNIT — I

**Attacks on Computers and Computer Security:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

**Cryptography: Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

#### UNIT — II

**Symmetric key Ciphers:** Block Cipher principles & Algorithms(DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution **Asymmetric key Ciphers:** Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman, ECC), Key Distribution.

#### UNIT — III

**Message Authentication Algorithms and Hash Functions:** Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm **Authentication Applications:** Kerberos, X.509 Authentication Service, Public — Key Infrastructure, Biometric Authentication

#### UNIT — IV

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, key management

#### UNIT — V

**Web Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction **Intruders, Virus and Firewalls:** Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls **Case Studies on Cryptography and security:** Secure **Inter-branch** Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections

#### TEXT BOOKS:

1. Cryptography and Network Security : William Stallings, Pearson Education, 4<sup>th</sup> Edition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 2<sup>nd</sup> Edition

#### REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2<sup>nd</sup> Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

#### Outcomes:

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

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### (R15A0520) WEB TECHNOLOGIES

#### Objectives:

- Giving the students the insights of the Internet programming and how to design and implement complete applications over the web.
- It covers the notions of Web servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts, Client-Side
- Programming, Server-Side Programming, Active Server Pages, Database Connectivity to web applications, Adding Dynamic content to web applications
- Programming Common Gateway Interfaces, Programming the User Interface for the web applications.

#### UNIT

I:

**Web Basics and Overview:** Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Tool box.

**HTML Common tags:** List, Tables, images, forms, frames, Basics of CSS and types of CSS. **Client-Side Programming (Java Script):** Introduction to Java Script, declaring variables, functions, Event handlers (onclick, onsubmit, etc.,) and Form Validation.

#### UNIT

II:

**Server-Side Programming (PHP):** Declaring Variables, Data types, Operators, Control structures, Functions, Reading data from web form controls like text buttons, radio buttons, list, etc., Handling File Uploads, Handling Sessions & Cookies.

**Introduction to XML:** Document type definition, XML Schemas, Document Object model, Presenting XML, Introduction to XHTML, Using XML Processors: DOM and SAX.

#### UNIT

III:

**Web Servers and Servlets:** Tomcat web server, Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat, **Introduction to Servlets:** Lifecycle of a Servlet, JSDK, Deploying Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet 150 parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking.

**UNIT****IV:**

**Introduction to JSP:** The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment, JSP Declarations, Directives, Expressions, Code Snippets, implement objects, Requests, Using Cookies and Session for Session Tracking.

**UNIT****V:**

**Database Access:** Database Programming using JDBC, JDBC drivers, Studying Javax.sql.\* package, Connecting to database in PHP, Execute Simple Queries, Accessing a Database from a Servlet and JSP page.

**Java Beans:** Introduction to Beans, Deploying java Beans in a JSP page.

**TEXT BOOKS:**

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech (UNIT s 1, 2)
2. Core SERVLETS AND JAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson (UNITs 3,4,5)

**REFERENCE BOOKS:**

1. Programming world wide web-Sebesta, Pearson Education ,2007.
2. Core SERVLETS AND JAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson
3. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
4. Jakarta Struts Cookbook, Bill Siggelkow, S P D O'Reilly for chap 8.
5. March's beginning JAVA JDK 5, Murach, SPD
6. An Introduction to Web Design and Programming –Wang-Thomson

**Outcomes:**

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Styles sheets.
- Installation and usage of Server software's.
- Database Connectivity to web applications
- Build web applications using Servlet and JSP

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### (R15A0521) SOFTWARE TESTING METHODOLOGIES

#### Objectives:

- This course is designed to enable a clear understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry. The course will prepare students to be leaders in software testing. Whether you are a developer or a tester, you must test software. This course is a unique opportunity to learn strengths and weaknesses of a variety of software testing techniques

#### UNIT I:

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs

#### UNIT II:

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

#### UNIT III:

Transaction Flow Testing: Transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

#### UNIT IV:

Paths, Path products and Regular expressions : Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing : Overview, decision tables, path expressions, kv charts, specifications.

#### UNIT V:

State, State Graphs and Transition testing : State graphs, good & bad state graphs, state testing, Testability tips. Graph Matrices and Application : Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional / Regression testing, creation of test script for unattended testing, synchronization of test case, Rapid testing, Performance testing of a data base application and HTTP connection for website access.

#### TEXT BOOKS:

- Software Testing techniques - Baris Beizer, Dreamtech, second edition.
- Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.

**REFERENCES:**

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

**Outcomes:**

Where will this subject help?

- Test process and continuous quality improvement
- Test generation from requirements
- Modeling techniques: UML: FSM and State charts, Combinatorial design; and others.
- Test generation from models.
- Test adequacy assessment.
- Industrial applications



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### INFORMATION SECURITY MANAGEMENT (SECURITY ANALYST — I) (Core Elective-II)

#### Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of Security Analyst
- To introduce the tools, technologies & programming languages which is used in day to day security analyst job role.

#### Unit I

##### Information Security Management:

Information Security Overview, Threats and Attack Vectors, Types of Attacks, Common Vulnerabilities and Exposures (CVE), Security Attacks, Fundamentals of Information Security, Computer Security Concerns, Information Security Measures etc.

**Manage your work to meet requirements (NOS 9001).**

#### Unit II

##### Fundamentals of Information Security:

Key Elements of Networks, Logical Elements of Network, Critical Information Characteristics, Information States etc.

**Work effectively with Colleagues (NOS 9002).**

#### Unit III

##### Data Leakage:

What is Data Leakage and statistics, Data Leakage Threats, Reducing the Risk of Data Loss, Key Performance Indicators (KPI), Database Security etc.

#### Unit IV

##### Information Security Policies, Procedures and Audits:

Information Security Policies-necessity-key elements & characteristics, Security Policy Implementation, Configuration, Security Standards-Guidelines & Frameworks etc.

#### Unit V

##### Information Security Management — Roles and Responsibilities:

Security Roles & Responsibilities, Accountability, Roles and Responsibilities of Information Security Management, team-responding to emergency situation-risk analysis process etc.

#### TEXT BOOK:

1. Management of Information Security by Michael E. Whitman and Herbert J. Mattord

#### REFERENCES:

1. <http://www.iso.orcdiso/home/standards/management-standards/iso27001.htm>
2. <http://csrc.nist.cio/publicationsinistpubs/800-55-Rev1/SP800-55-revi.pdf>

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**(R15A0523) INTRODUCTION TO ANALYTICS  
(ASSOCIATE ANALYTICS I)  
(Core Elective-II)**

**Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of Analytics for Business
- To introduce the tools, technologies & programming languages which is used in day to day analytics cycle

**Unit I****Introduction to Analytics and R programming (NOS 2101):**

Introduction to R, RStudio (GUI): R Windows Environment, introduction to various data types, Numeric, Character, date, data frame, array, matrix etc., Reading Datasets, Working with different file types .txt,.csv etc. Outliers, Combining Datasets, R Functions and loops.

**Manage your work to meet requirements (NOS 9001):**

Understanding Learning objectives, Introduction to work & meeting requirements, Time Management, Work management & prioritization, Quality & Standards Adherence,

**Unit II****Summarizing Data & Revisiting Probability (NOS 2101):**

Summary Statistics - Summarizing data with R, Probability, Expected, Random, Bivariate Random variables, Probability distribution. Central Limit Theorem etc.

**Work effectively with Colleagues (NOS 9002):**

Introduction to work effectively, Team Work, Professionalism, Effective Communication skills, etc.

**Unit III****SQL using R:**

Introduction to NoSQL, Connecting R to NoSQL databases. Excel and R integration with R connector.

**Unit IV****Correlation and Regression Analysis (NOS 9001):**

Regression Analysis, Assumptions of OLS Regression, Regression Modelling. Correlation, ANOVA, Forecasting, Heteroscedasticity, Autocorrelation, Introduction to Multiple Regression etc.

## Unit V

### **Understand the Verticals - Engineering, Financial and others (NOS 9002):**

Understanding systems viz. Engineering Design, Manufacturing, Smart Utilities, Production lines, Automotive, Technology etc.

Understanding Business problems related to various businesses

### **Requirements Gathering**

Gathering all the data related to Business objective

### **TEXT BOOK:**

#### **1. Student's Handbook for Associate Analytics.**

### **REFERENCE BOOKS:**

1. **Introduction to Probability and Statistics Using R**, ISBN: 978-0-557-24979-4, is a textbook written for an undergraduate course in probability and statistics.
2. An Introduction to R, by Venables and Smith and the R Development Core Team. This may be downloaded for free from the R Project website (<http://www.r-project.org/>, see Manuals). There are plenty of other free references available from the R Project website.
3. Montgomery, Douglas C., and George C. Runger, Applied statistics and probability for engineers. John Wiley & Sons, 2010
4. The *Basic Concepts of Time Series Analysis*.<http://anson.ucdavis.edu/~azarifsta137/AuNotes.pdf>
5. **Time Series Analysis and Mining with R**, Yanchang Zhao.

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### (R15A0524) DISTRIBUTED SYSTEMS

#### (Core Elective-II)

#### Objectives:

- To learn the principles, architectures, algorithms and programming models used in distributed systems.
- To examine state-of-the-art distributed systems, such as Google File System.
- To design and implement sample distributed systems.

#### UNIT I

**Characterization of Distributed Systems:** Introduction, Examples of Distributed systems, Resource sharing and web, challenges.

**System models:** Introduction, Architectural and Fundamental models, networking and Internetworking, Interposes Communication.

#### UNIT II

**Time and Global States:** Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global States, distributed debugging.

**Coordination and Agreement:** Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

#### UNIT III

**Inter process Communication:** Introduction ,The API for the Internet Protocols, External Data Representation and Marshalling, Client –Server Communication, Group Communication, Case Study: IPC in UNIX.

**Distributed Objects and Remote Invocation:** Introduction, Communication between distributed objects, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

#### UNIT IV

**Distributed File Systems:** Introduction, File Service Architecture, Case Study

1: Sun Network File System, Case Study2:The Andrew File System

**Name Services:** Name Services: Introduction, Name Services and the Domain Name System, Case study of the Global Name Service

**Distributed Shared Memory:** Introduction, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models.

## **UNIT V**

**Transactions and Concurrency control:** Introduction, Transactions, Nested Transactions, Locks, optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

**Distributed Transactions:** Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

### **TEXT BOOKS:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education. 2009.

### **REFERENCES:**

1. Distributed Systems, Principles and paradigms, Andrew S.Tanenbaum, Maarten Van Steen, Second Edition, PHI.
2. Distributed Systems, An Algorithm Approach, Sikumar Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2007.

### **Outcomes:**

- Students will identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
- Students will examine how existing systems have applied the concepts of distributed systems in designing large systems, and will additionally apply these concepts to develop sample systems.

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**(R15A0525) ARTIFICIAL INTELLIGENCE & NEURAL NETWORKS****(Core Elective-II)****Objectives:**

- Introduction to Artificial Intelligence, Autonomous Agents
- Problem solving, Search, Heuristic methods
- State space Learning, CSP's, Game Playing
- Fundamental concepts of neural networks and different network models
- Biological Neuron, Comparison between brain and computer
- Different Learning Laws, 7. Single Layer Perceptron's, 8. Multilayer Perceptron's

**UNIT I**

Introduction to AI – Foundations of AI – History of AI - Intelligent Agents – Agents and Environments – Nature of Environments – Structure of Agents – Problem solving Agents – Problem formulation – Example Problems

**UNIT II**

Search Techniques – Uninformed Search Strategies – Breadth first search – Depth first search – Depth limited search – Iterative deepening depth first search - Bi-directional search – comparison – Search with partial information - Heuristic search – Greedy best first search – A\* search – Memory bounded heuristic search - Heuristic functions - Local search algorithms - Hill climbing – Simulated annealing search - Local beam search – Genetic algorithms

**UNIT III**

Constraint satisfaction problems – Backtracking search for CSP's - local search for constraint satisfaction problem.

Adversarial search – Games - Minimax algorithm - optimal decisions in multiplayer games - Alpha beta pruning - evaluation functions - cutting off search.

**UNIT IV**

What is a neural network, Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Artificial Intelligence and Neural Networks. Learning Laws, Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning.

## **UNIT V**

Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, Perceptron and its convergence theorem, Introduction to Multilayer Perceptron, Back propagation algorithm.

### **TEXT BOOKS**

1. Artificial Intelligence: A modern approach by Stuart Russell and Peter Norvig. 3rd Edition, Prentice Hall, 2010.
2. Fundamentals of new Artificial Intelligence (second edition) by Toshinori Munakata. Springer Second Edition.
3. "Artificial Intelligence", 2nd Edition., E.Rich and K. Knight (TMH).
4. Neural networks A comprehensive foundations, Simon Haykin, Pearson Education, 2<sup>nd</sup> Edition, 2004
5. Neural networks in Computer intelligence, Li Min Fu TMII2003

### **Outcomes:**

Upon completion of this course, students should be able to:

1. Describe the key components of the artificial intelligence.
2. Enumerate the types of Agents and Environments
3. Explain search strategies and solve problems by applying a suitable search method
4. Relate the functioning of brains and artificial neural network models.
5. Explain and contrast the most common architectures and learning algorithms
6. Develop simple Single Layer and Multi-Layer Perceptron models

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**(R15A0424) EMBEDDED SYSTEMS****(Open Elective-IV)****Course objectives:**

For embedded systems, the course will enable the students to:

- To understand the basics of microprocessors and microcontrollers architecture and its functionality.
- Understand the core of an embedded system.
- To learn the design process of embedded system applications.
- To understand the RTOS and inter-process communication.

**UNIT-I:INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS: 8086**

**Microprocessor:** Architecture of 8086, Register Organization, Programming Model, Memory Segmentation, Signal descriptions of 8086, Addressing modes, Instruction Set.

**8051 Microcontroller:** 8051 Architecture, I/O Ports, Memory Organization, Instruction set of 8051, memory interfacing to 8051.

**UNIT-II: INTRODUCTION TO EMBEDDED SYSTEMS:**

History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, Applications of embedded systems, and characteristics of embedded systems, Operational and Non-operational attributes of embedded systems.

**UNIT-III: TYPICAL EMBEDDED SYSTEM**

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory selection for embedded systems; Sensors and actuators , Onboard communication interfaces-I2C, SPI. External communication interfaces: RS232, WIFI.

**UNIT-IV: EMBEDDED FIRMWARE DESIGN AND DEVELOPMENT:** Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.



### **UNIT-V RTOS BASED EMBEDDED SYSTEM DESIGN**

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-preemptive and pre-emptive scheduling; Device drivers, How to choose an RTOS.

#### **TEXT BOOKS:**

1. D. V. Hall, Microprocessors and Interfacing, TMGH, 2nd Edition 2006.
2. Kenneth. J. Ayala, The 8051 Microcontroller , 3rd Ed., Cengage Learning
3. Introduction to Embedded Systems - shibu k v, Mc Graw Hill Education.

#### **REFERENCE BOOKS:**

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandi, TMH, 2nd Edition 2006
2. Embedded Systems- An integrated approach - Lyla B Das, Pearson education 2012.

#### **Course Outcomes:**

After going through this course the student will be able to

- The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.
- Understand and design the Embedded systems
- Understand Embedded Firmware design approaches
- Learn the basics of RTOS

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### (R15A0426) DIGITAL IMAGE PROCESSING

#### Objectives:

The course objectives are:

- Provide the student with the fundamentals of digital image processing
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

#### UNIT I

**Digital image fundamentals & Image Transforms:-** Digital Image fundamentals, Sampling and quantization, Relationship between pixels.

**Image Transforms:** 2-D FFT , Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, Hotelling transform.

#### UNIT II

**Image enhancement (spatial domain) :** Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, Linear and non linear gray level Transformation, local or neighborhood operation, median filter, spatial domain high-pass filtering.

**Image enhancement (Frequency domain):** Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass(smoothing) and High Pass (sharpening) filters in Frequency Domain

#### UNIT III

**Image Restoration:** Degradation Mode, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration

#### UNIT IV

**Image segmentation:** Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation

**Morphological Image Processing :** Dilation and Erosion, Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.

## **UNIT V**

### **Image Compression:**

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

### **TEXT BOOKS:**

1. Digital Image Processing- Rafeal C.Gonzalez, Richard E.Woods, 3<sup>rd</sup> Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S. Essakkirajan, T. Veerakumar-TMH,2010

### **REFERENCE BOOKS:**

1. Digital Image Processing and analysis-human and computer vision application with using CVIP Tools – Scotte Umbaugh, 2<sup>nd</sup> Ed, CRC Press, 2011
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Fundamentals of Digital Image Processing-A.K. Jain, PHI, 1989
4. Digital Image Processing and computer Vision-Somka, Halavac, Boyle-Cengage learning (Indian edition) 2008,
5. Digital Image Processing using Matlab, Rafeal C.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education.
6. Introduction to Image Processing & Analysis-John C.Russ, J. Christian Russ, CRC Press, 2010
7. Digital Image Processing with MATLAB & Labview-Vipula Singh Elsevier

### **Outcomes:**

- Upon Successfully completing the course, the student should:
- Have an appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression
- Be able to implement basic image processing algorithms in MATLAB.
- Have the skill base necessary to further explore advanced topics of Digital Image Processing.
- Be in a position to make a positive professional contribution in the field of Digital Image Processing.
- At the end of the course the student should have a clear impression of the breadth and practical scope of Digital Image Processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.

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### (R15A0432) WIRELESS COMMUNICATIONS AND NETWORKS (Open Elective-IV)

**Objectives:**

- To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communication to equip the students with various kinds of wireless networks and its operations.
- To prepare the students to understand the concept of frequency reuse and be able to apply it in the design of mobile cellular system
- To prepare the students to understand various modulation schemes and multiple access techniques that are used in wireless communications
- To provide an analytical perspective on the design and analysis the traditional and emerging wireless networks and to discuss the nature of and solution methods to the fundamental problems in the wireless networking
- To train the students to understand the architecture and operation of various wireless WAN such as GSM, IS-95, GPRS and SMS
- To train students to understand wireless LAN architectures and operations
- To prepare students to understand the emerging technique OFDM and its importance in the wireless communications

**UNIT -I**

INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS: Evolution of mobile radio communications, examples of wireless communication systems-paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems, trends in cellular radio and personal communications. MODERN WIRELESS COMMUNICATION SYSTEMS: Second generation (2G) cellular networks, third generation (3G) wireless networks, wireless local loop (WLL) and LMDS, wireless local area networks (WLANs), Bluetooth and personal area networks (PANs).

**UNIT –II:**

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models-Longley-Rice Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

**UNIT –III:**

Mobile Radio Propagation: Small –Scale Fading and Multipath Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel-

Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

#### **UNIT –IV**

WI-FI AND THE IEEE 802.11 WIRELESS LAN STANDARD: IEEE 802 Architecture, IEEE 802.11 Architecture and Services, 802.11Medium Access Control, 802.11 Physical Layer, Other IEEE 802.11 Standards, Wi-Fi Protected Access.BLUETOOTH AND IEEE 802.15: Overview, radio specification, baseband specification, link manager specification, logical link control and adaptation protocol, IEEE 802.15.

#### **UNIT -V**

MOBILE DATA NETWORKS: Introduction, data oriented CDPD network, GPRS and higher data rates, short messaging service in GSM, mobile application protocols.WIRELESS ATM & HIPERLAN: Introduction, Wireless ATM, HIPERLAN, HIPERLAN-2.

#### **TEXT BOOKS:**

1. Theodore S. Rappaport (2002), Wireless Communications -Principles Practice,2<sup>nd</sup> edition, Prentice Hall of India, New Delhi.
2. William Stallings (2009), Wireless Communications and Networks,2<sup>nd</sup> edition, Pearson Education, India.
3. Kaveh PahLaven, Prashanth Krishna Murthy (2007), Principles of Wireless Networks -A Unified Approach, Pearson Education, India.

#### **REFERENCE BOOKS:**

1. Dr. Kamilo Feher (2003), Wireless Digital Communications,Prentice Hall of India, New Delhi.
2. Jochen Schiller (2009), Mobile Communications, 2<sup>nd</sup> edition, Pearson Education, India.
3. Andreas F. Molisch (2006), Wireless Communications, Wiley –India, New Delhi.

#### **Outcomes:**

Upon completion of the course the student will be able to:

- Understand the principles of wireless communications
- Understand fundamentals of wireless networking
- Understand cellular system design concepts
- Analyze various multiple access schemes using wireless communication
- Understand Wireless WANs and their performance analysis
- Demonstrate wireless LAN and their specifications
- Familiar with some of the existing and emerging wireless standards
- Understand the concept of OFDM

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**(R15A0588) WEB TECHNOLOGIES LAB****Objectives:**

- To enable the student to program web applications using the following technologies HTML, Javascript ,AJAX, PHP ,Tomcat Server, Servlets ,JSP

**Note:**

1. **Use LAMP Stack (Linux, Apache, MySQL and PHP) for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform wherever applicable**

2. **The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed**

1. Install the following on the local machine

- Apache Web Server (if not installed)
  - Tomcat Application Server locally
  - Install MySQL (if not installed)
  - Install PHP and configure it to work with Apache web server and MySQL (if not already configured)
2. 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.
  3. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.
  4. Write an HTML page that contains a selection box with 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. Create an XML document that contains 10 users information. Write a Java program, which takes User Id as input and returns the user details by taking the user information from the XML document using (a) DOM Parser and (b) SAX parser
  6. Implement the following web applications using (a) PHP, (b) Servlets and (c) JSP:
    - i. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.
    - ii. Modify the above program to use an xml file instead of database.
    - iii. Modify the above program to use AJAX to show the result on the same page below the submit button.

- iv. A simple calculator web application that takes two numbers and an operator (+, /, \* and %) from an HTML page and returns the result page with the operation performed on the operands.
- v. Modify the above program such that it stores each query in a database and checks the database first for the result. If the query is already available in the DB, it returns the value that was previously computed (from DB) or it computes the result and returns it after storing the new query and result in DB.
- vi. A web application takes a name as input and on submit it shows a hello <name> page where <name> is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name> message with the duration of usage (hint: Use session to store name and time).
- vii. A web 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.
- viii. A 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 user's full name is asked and on submitting the full name, it stores, the login name, password and full name in the database (hint: use session for storing the submitted login name and password)
- ix. A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.

**TEXT BOOKS:**

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

**REFERENCE BOOKS:**

1. Web Programming, building internet applications, Chris Bates 2<sup>nd</sup> edition, Wiley Dreamtech
2. Java Server Pages — Hans Bergsten, SPD O'Reilly
3. Java Script, D.Flanagan, O'Reilly, SPD.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W.Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web — How to program, Dietel and Nieto, Pearson.

**Outcomes:**

- Use LAMP Stack for web applications

- Use Tomcat Server for Servlets and JSPs
- Write simple applications with Technologies like HTML, Javascript, AJAX, PHP, Servlets and JSPs
- Connect to Database and get results
- Parse XML files using Java (DOM and SAX parsers)



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### (R15A0589) CASE TOOLS and SOFTWARE TESTING METHODOLOGY LAB

#### Objectives:

Understand how UML supports the entire GOAD process.

Become familiar with all phases of GOAD.

Understand different software testing tools and their features

Students are divided into batches of 5 each and each batch has to

draw the following diagrams using UML for an ATM system whose description is given below.

UML diagrams to be developed are:

1. Use Case Diagram.
2. Class Diagram.
3. Sequence Diagram.
4. Collaboration Diagram.
5. State Diagram
6. Activity Diagram.
7. Component Diagram
8. Deployment Diagram.
9. Test Design.

#### Description for an ATM System

The software to be designed will control a simulated automated teller machine (ATM) having a magnetic stripe reader for reading an ATM card, a customer console (keyboard and display) for interaction with the customer, a slot for depositing envelopes, a dispenser for cash (in multiples of Rs. 100, Rs. 500 and Rs. 1000), a printer for printing customer receipts, and a key-operated switch to allow an operator to start or stop the machine. The ATM will communicate with the bank's computer over an appropriate communication link. (The software on the latter is not part of the requirements for this problem.)

The ATM will service one customer at a time. A customer will be required to insert an ATM card and enter a personal identification number (PIN) - both of which will be sent to the bank for validation as part of each transaction. The customer will then be able to perform one or more transactions. The card will be retained in the machine until the customer indicates that he/she desires no further transactions, at which point it will be returned - except as noted below.

The ATM must be able to provide the following services to the customer:

1. A customer must be able to make a cash withdrawal from any suitable account linked to the card, in multiples of Rs. 100 or Rs. 500 or Rs. 1000. Approval must be obtained from the bank before cash is dispensed.
2. A customer must be able to make a deposit to any account linked to the card, consisting of cash and/or checks in an envelope. The customer will enter the amount of the deposit into the ATM, subject to manual

verification when the envelope is removed from the machine by an operator. Approval must be obtained from the bank before physically accepting the envelope.

3. A customer must be able to make a transfer of money between any two accounts linked to the card.
4. A customer must be able to make a balance inquiry of any account linked to the card.
5. A customer must be able to abort a transaction in progress by pressing the Cancel key instead of responding to a request from the machine.

The ATM will communicate each transaction to the bank and obtain verification that it was allowed by the bank. Ordinarily, a transaction will be considered complete by the bank once it has been approved. In the case of a deposit, a second message will be sent to the bank indicating that the customer has deposited the envelope. (If the customer fails to deposit the envelope within the timeout period, or presses cancel instead, no second message will be sent to the bank and the deposit will not be credited to the customer.)

If the bank determines that the customer's PIN is invalid, the customer will be required to re-enter the PIN before a transaction can proceed. If the customer is unable to successfully enter the PIN after three tries, the card will be permanently retained by the machine, and the customer will have to contact the bank to get it back.

If a transaction fails for any reason other than an invalid PIN, the ATM will display an explanation of the problem, and will then ask the customer whether he/she wants to do another transaction.

The ATM will provide the customer with a printed receipt for each successful transaction

The ATM will have a key-operated switch that will allow an operator to start and stop the servicing of customers. After turning the switch to the "on" position, the operator will be required to verify and enter the total cash on hand. The machine can only be turned off when it is not servicing a customer.

When the switch is moved to the "off" position, the machine will shut down, so that the operator may remove deposit envelopes and reload the machine with cash, blank receipts, etc.

**Outcomes:**

- Ability to understand the history, cost of using and building CASE tools.
- Ability to construct and evaluate hybrid CASE tools by integrating existing tools.

## **SOFTWARE TESTING METHODOLOGY LAB**

**Objectives:**

- This course is designed to enable a clear understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry.
- Whether you are a developer or a tester, you must test software. This course is a unique opportunity to learn strengths and weaknesses of a variety of software testing techniques.

**WEEK 1:** Introduction to Testing**WEEK 2:** Write a program in C language to demonstrate the working of the following constructs:

- |                |                   |
|----------------|-------------------|
| i) Do...while  | ii) while...do    |
| iii) If...else | iv) switch v) for |

**WEEK 3:** "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.

**WEEK 4:** Write atleast 30 test cases to test the functionality of ATM machine

**Week 5:** Banking application test cases

**Week 6:** Prepare a test case document to test Library management system manually

**Week 7:** Study of any testing tool (Win runner)

**Week 8:** Study of any web testing tool (Selenium)

**Week 9:** Study of any bug tracking tool (Bugzilla, Bugbit)

**Week 10:** Study of any test management tool(Test Director)

**Week 11:** a) Study of any open source testing tool (Test Link)

b) Test Facebook manually (beyond the syllabus)

**Week 12:** Take a mini project and execute it. During SDLC create the various UML diagrams required for designing and all testing documents like test plan, TCD etc

**Outcomes:**

1. The students understands the process to be followed in the software development life cycle
2. Finds practical solutions to the problems
3. Manage a project from beginning to end
4. Define, formulate and analyze a problem

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### (R15A0526) DATA WAREHOUSING AND DATA MINING

#### Objectives:

Study data warehouse principles and its working learn data mining concepts understand association rules mining. Discuss classification algorithms learn how data is grouped using clustering techniques.

#### UNIT-I

**Data warehouse:** Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

#### UNIT-II

**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 Data Warehouse System, Major issues in Data Mining.

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

#### UNIT-III

**Association Rules:** Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

#### UNIT-IV

**Classification:** Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics.

**Prediction:** Accuracy and Error measures. Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods

#### UNIT-V

**Cluster Analysis :** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods,

Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model based Clustering Methods, Outlier Analysis.

**TEXT BOOKS:**

- 1) Data Mining- Concepts and -1.chniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
- 2) Introduction to Data Mining, Psng-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Educator.

**REFERENCE BOOKS:**

- 1) Data Mining Techniques, Arun KPujari, 3rd Edition, Universities Press.
- 2) Data Warehousing Fundament's, Pualraj Ponnaiah, Wiley Student Edition.
- 3) The Data Warehouse Life CycleToolkit — Ralph Kimball, Wiley Student Edition.
- 4) Data Mining, Vikaram Pudi, P Rddha Krishna, Oxford University Press

**Outcomes:**

- Student should be able to understand why the data warehouse in addition to database systems.
- Ability to perform the pre-processing of data and apply mining techniques on it.
- Ability to identify the association rules, classification and clusters in large data sets.
- Ability to solve real world problems in business and scientific information using data mining

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### (R15A0527) LINUX PROGRAMMING

#### Objectives:

- To develop the skills necessary for Unix systems programming including file system programming, process and signal management, and interprocess communication.
- To make effective use of Unix utilities and Shell scripting language such as bash.
- To develop the basic skills required to write network programs using Sockets.

#### UNIT I

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.

Sed-Scripts, Operation, Addresses, Commands, Applications, awk- Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications.

Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, 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, interrupt processing, functions, debugging shell scripts.

#### UNIT II

Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2, 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. Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir, seekdir, telldir functions.

#### UNIT III

Process – Process concept, Kernel support for process, process identification, process hierarchy, process states, process control - process creation, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, system, I/O redirection

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.

#### **UNIT IV**

Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, 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. Message Queues- Kernel support for messages, APIs for message queues, client/server example. Semaphores- Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

#### **UNIT V**

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example. Sockets- Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (Unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Comparison of IPC mechanisms.

#### **TEXT BOOKS:**

1. Unix System Programming using C++, T.Chan, PHI.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH, 2006.
3. Unix Network Programming, W.R.Stevens, PHI

#### **REFERENCE BOOKS:**

1. Linux System Programming, Robert Love, O'Reilly, SPD, rp-2007.
2. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson 2003,
3. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson.
4. System Programming with C and Unix, A.Hoover, Pearson.

#### **Outcomes:**

- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting
- Work confidently in Unix/Linux environment

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### (R15A0528) DESIGN PATTERNS

#### Objectives:

- Design patterns are a systematic approach that focus and describe abstract systems of interaction between classes, objects, and communication flow
- Given OO design heuristics, patterns or published guidance, evaluate a design for applicability, reasonableness, and relation to other design criteria.
- Comprehend the nature of design patterns by understanding a small number of examples from different pattern categories, and to be able to apply these patterns in creating an OO design.
- Good knowledge on the documentation effort required for designing the patterns.

#### UNIT I:

**Introduction:** What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

#### UNIT II:

**A Case Study:** Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, and Supporting Multiple Look – and – Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

**Creational Patterns:** Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

#### UNIT III:

**Structural Pattern Part - I:** Adapter, Bridge, and Composite

**Structural Pattern Part - II:** Decorator, Façade, Flyweight, Proxy.

#### UNIT IV:

**Behavioral Patterns Part - I:** Chain of Responsibility, Command, Interpreter, Iterator

**Behavioral Patterns Part - II:** Mediator, Memento, Observer

#### UNIT V:

**Behavioral Patterns Part – II(cont'd):** State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.



**TEXT BOOK:**

1. Design Patterns by Erich Gamma, Pearson Education

**References:**

1. Pattern's in Java Vol-I by Mark Grand, Wiley DreamTech.
2. Pattern's in Java Vol-II by Mark Grand, Wiley DreamTech.
3. Java Enterprise Design Patterns Vol-III by Mark Grand, Wiley DreamTech.
4. Head First Design Patterns by Eric Freeman – Oreilly-sp.
5. Design Patterns Explained by Alan Shalloway, Pearson Education.

**Outcomes:**

Upon completion of this course, students should be able to:

- Have a deeper knowledge of the principles of object - oriented design
- Understand how these patterns related to object - oriented design.
- Understand the design patterns that are common in software applications.
- Will able to use patterns and have deeper knowledge of patterns.
- Will be able to document good design pattern structures.

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### (R15A0529) CLOUD COMPUTING

Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

#### UNIT- I

**Systems Modeling, Clustering and Virtualization: Distributed System**

Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

#### UNIT- II

**Foundations:** Introduction to Cloud Computing, Migrating into a Cloud. Enriching the 'Integration as a Service' Paradigm for the Cloud Era. The Enterprise Cloud Computing Paradigm.

#### UNIT- III

**Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS):** Virtual machines provisioning and Migration services. On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service. Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds. Understanding Scientific Applications for Cloud Environments.

#### UNIT- IV

**Monitoring, Management and Applications:** An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing. Performance Prediction for HPC on Clouds. Best Practices in Architecting Cloud Applications in the AWS cloud. Building Content Delivery networks using Clouds, Resource Cloud Mashups.

#### UNIT- V

**Governance and Case Studies:** Organizational Readiness and Change management in the Cloud age. Data Security in the Cloud, Legal issues in Cloud computing, Achieving Production Readiness for Cloud Services

**TEXT BOOKS:**

1. Cloud Computing: Principles and Paradigms by Raikumar Buyya  
James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.

**Reference Books:**

1. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation, Management and Security, John W.Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

**Outcomes:**

- Ability to understand the virtualization and cloud computing concepts.

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**(R15A0530) INFORMATION SECURITY ASSESSMENTS & AUDITS**  
**(SECURITY ANALYST-II)**  
**(Core Elective-III)**

**Unit I****Information Security Performance Metrics and Audit:**

Security Metrics and Reporting, Common Issues and Variances of Performance Metrics, Introduction to Security Audit, Servers and Storage devices, Infrastructure and Networks, Communication Routes, Information Security Methodologies (Black-box, White-box, Grey-box), Phases of Information Security Audit and Strategies, Ethics of an Information Security Auditor etc.

**Maintain Healthy, Safe & Secure Working environment (NOS 9003).**

**Unit II****Information Security Audit Tasks, Reports and Post Auditing Actions:**

Pre-audit checklist, Information Gathering, Vulnerability Analysis, External Security Audit, Internal Network Security Audit, Firewall Security Audit, IDS Security Auditing, Social Engineering Security Auditing, Web Application Security Auditing, Information Security Audit Deliverables & Writing Report, Result Analysis, Post Auditing Actions, Report Retention etc.

**Provide Data/information in Standard formats (NOS 9004).**

**Unit III****Vulnerability Management:**

Information Security Vulnerabilities — Threats and Vulnerabilities, Human-based Social Engineering, Computer-based Social Engineering, Social Media Countermeasures, Vulnerability Management — Vulnerability Scanning, Testing, Threat management, Remediation etc.

**Unit IV****Information Security Assessments:**

Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions & Considerations, Vulnerability Assessment Reports — Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

**Unit V****Configuration Reviews:**

Introduction to Configuration Management, Configuration Management Requirements-Plan-Control, Development of configuration Control Policies, Testing Configuration Management etc.

**TEXT BOOKS:**

Prescribed books:-

1. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K.Gavrilenko, and A.Michajlowski
2. The Art of Computer Virus Research and Defense by Peter Szor."

**REFERENCES:**

1. <https://www.sans.org/reading-room/whitepapers/threats/implementino-vulnerability-management-process34180>
2. <http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.odf>

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### (R15A0531) BIG DATA ANALYTICS (ASSOCIATE ANALYTICS — II) (Core Elective-III)

#### Unit I:

##### **Data Management (NOS 2101):**

Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/signal/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Preprocessing.

Export all the data onto Cloud ex. AWS/Rackspace etc.

##### **Maintain Healthy, Safe & Secure Working Environment (NOS 9003):**

Introduction, workplace safety, Report Accidents & Emergencies, Protect health & safety as your work, course conclusion, assessment

#### Unit II

##### **Big Data Tools (NOS 2101):**

Introduction to Big Data tools like Hadoop, Spark, Impala etc., Data ETL process, Identify gaps in the data and follow-up for decision making.

##### **Provide Data/Information in Standard Formats (NOS 9004):**

Introduction, Knowledge Management, Standardized reporting & compliances, Decision Models, course conclusion. Assessment.

#### Unit III

##### **Big Data Analytics:**

Run descriptives to understand the nature of the available data, collate all the data sources to suffice business requirement, Run descriptive statistics for all the variables and observe the data ranges, Outlier detection and elimination.

#### Unit IV

##### **Machine Learning Algorithms (NOS 9003):**

Hypothesis testing and determining the multiple analytical methodologies, Train Model on 2/3 sample data using various Statistical/Machine learning algorithms, Test model on 1/3 sample for prediction etc.

#### Unit V

##### **(NOS 9004)**

##### **Data Visualization (NOS 2101):**

Prepare the data for Visualization, Use tools like Tableau, JlickView and D3, Draw insights out of Visualization tool. Product Implementation

**TEXT BOOK**

1. **Student's Handbook for Associate Analytics.**

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira (the authors have kindly made an online version available): <http://www.dataminingbook.info/uoloads/book.pdf>
3. Mining of Massive Datasets Jure Leskovec Stanford Univ. Anand RajaramanMilliway Labs Jeffrey D. Ullman Stanford Univ.
4. ([http://www.vistrails.org/index.php/Course:\\_\\_Big\\_Data\\_Analysis](http://www.vistrails.org/index.php/Course:__Big_Data_Analysis))

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### (R15A0532) MOBILE COMPUTING (Core Elective-III)

#### Objectives:

- Introduction of an advanced element of learning in the field of wireless communication. Expose the students to the concepts of wireless devices and mobile computing.

**UNIT I: Introduction:** Mobile Communications, Mobile Computing: Paradigm, Promises/Novel Applications and Impediments and architecture. Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM: Services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services, GPRS, CSHSD, DECT.

**UNIT II: (Wireless) Medium Access Control (MAC):** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. MAC Protocols for GSM, Wireless LAN (IEEE802.11) Collision Avoidance (MACA, MACAW) Protocols.

**Mobile Network Layer:** IP and Mobile IP network Layers, packet delivery, and Handover Management, Location Management Registration, Tunnelling and Encapsulation, Route Optimization, DHCP.

**UNIT III: Mobile Transport Layer:** Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

**Database Issues:** Database Hoarding & Caching techniques, C-S Computing & Adaptation, Transactional Models, Query Processing, Data Recovery Process & QoS Issues.

**UNIT IV:** Data Dissemination and Synchronization, Communications asymmetry, classification of data delivery mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Methods, Digital Audio and Video Broadcasting (DAB & DVB). Data Synchronization – Introduction, software, and Protocols.

#### UNIT V: Mobile Ad hoc Networks (MANETs):

Introduction, Applications & Challenges of a MANET, ROUTING, Classification of routing Algorithms, algorithms such as DSR, AODV, DSDV, etc.. Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing WAP, Bluetooth, XML, J2ME, JavaCard, Windows, phone 7, android, Iphone.

#### TEXT BOOKS:

1. Raj Kamal, "Mobile Computing", oxford University Prwess, 2007, ISBN: 0195686772.



**REFERENCE BOOKS:**

1. Jochen Schiller, "Mobile Communications, Addison-Wesley, Second Edition, 2004.
2. Stojmenovic and Cacute, "Handbook of wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile. Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004.

**Outcomes:**

At the end of this course the student should be able

- To understand the concept of mobile computing and architecture of mobile communication.
- Apply the concepts of mobile communications to the transactions and transaction management.
- Apply the concepts of mobile computing and conventional wired network and simulate it on the simulator.
- To understand the working of heterogeneous networks.

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### (R15A0533) COMPUTER FORENSICS (Core Elective-III)

#### Objectives:

- A brief explanation of the objective is to provide digital evidences which are obtained from digital media.
- In order to understand the objectives of computer forensics, first of all people have to recognize the different roles computer plays in a certain crime.
- According to a snippet from the United States Security Service, the functions computer has in different kinds of crime.

#### UNIT-I

**Computer Forensics Fundamentals:** What is computer Forensics?, Use of computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists

**Types of Computer Forensics Technology:** Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic Technology- Types of Business Computer Forensic Technology.

**Computer Forensics Evidence and Capture:** Data recovery Defined- Data Back-up and Recovery- The Role of Back-up and Data Recovery- The Data Recovery Solution

#### UNIT-II

**Evidence Collection and Data Seizure:** Why Collect Evidence? Collection Options – Obstacles – Types of Evidence – The Rules of Evidence – Volatile Evidence – General Procedure – Collection and Archiving – Methods of Collection – Artifacts – Collection Steps – Controlling Contamination: The Chain of Custody

**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 Consideration – Practical Implementation

#### UNIT – III

**Computer Forensic analysis and validation:** Determining what data to collect and analyze, validating forensic data, addressing data – hiding techniques, performing remote acquisitions

**Network Forensics:** Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

**Processing Crime and Incident Scenes:** Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer

incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

#### **UNIT – VI**

**Current Computer Forensic tools:** evaluating computer forensic tool needs, computer forensic software tools, computer forensic hardware tools, validating and testing forensics software

**E – Mail Investigations:** Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools

**Cell phone and mobile device forensics:** Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

#### **UNIT – V**

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

#### **TEXT BOOKS:**

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

#### **REFERENCE BOOKS:**

1. Real Digital Forensics by Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Addison – Wesley Pearson Education
2. Forensic Compiling. A Tractitioneris Guide by Tony Sammes and Brain Jenkinson, Springer International edition.
3. Computer Evidence Collection & Presentation by Christopher L.T.Brown, Firewall Media.
4. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.
5. Software Forensics Collecting Evidence from the scene of a Digital Crime by Robert M.Slade, TMH 2005
6. Windows Forensics by Chad Steel, Wiley India Edition.

#### **Outcomes:**

- Students will understand the usage of computers in forensic and how to use various forensic tools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics

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**(R15A0534) PARALLEL PROCESSING  
(Core Elective-IV)****Objectives:**

- To understand the basic concepts in parallel computing architecture
- To be familiar with the taxonomies and parallel programming models
- To be able to identify promising applications of parallel computing
- To develop parallel algorithms & implement prototype parallel programs using MPI & OpenMP
- To evaluate the performance metrics of parallel programs with various measures

**UNIT-I****Parallel computing**

parallelism, parallel architecture - scope of parallel computing, parallel programming platform, implicit parallelism, limitations of system memory - physical organization of parallel platforms, communication cost in parallel machines, analytical modelling of parallel programs.

**UNIT-II****Parallel algorithm design**

Decomposition techniques, recursive, data, explorative, speculative, hybrid - tasks and interaction, characteristics, mapping techniques, load balancing, static mapping, dynamic, mapping, interaction overhead, algorithm models - foster's design methodology

**UNIT-III****Message passing paradigm**

Principles of programming, Basic building block, send and receive, MPI, Library, Communicators, Examples - circuit satisfiability, functions, compile and run ,topologies and embedding, collective communication, shared memory programming, parallel loops, data parallelism, critical section, functional parallelism

**UNIT-IV****Parallel programming**

Sieve of Eratosthenes, sequential algorithm, Data Decomposition, parallel algorithm, analysis - Floyd's Algorithm, Design parallelism, analysis, Matrix Multiplication - Sorting - parallel quicksort, hyper quicksort, regular sampling, Combinatorial search, parallel Backtracking, parallel branch and bound-parallel alpha-beta search, analysis.

**UNIT –V****Performance analysis and applications**

Sources of overhead, Performance Metrics, Parallel overhead, speed up, efficiency, cost, Amdahl's law, Asymptotic analysis, GPU computing, Introduction to Parallel Search - Met heuristic Algorithm, Principles, Parallel Models, Design of GPU based algorithm, Parallelisation control, Memory management, Application to TSP, Comparison, Execution time approximation, Overview, EMMA method, Comparison, Case Study.

**TEXT BOOKS:**

1. Ananth Grama, George Karypis, Vipin Kumar, and Anshul Gupta, "Introduction to Parallel Computing", Addison Wesley, Second Edition ,2003
2. Ted G. Lewis and H. El-Rewini, "Introduction to Parallel Computing", Prentice-Hall, 1992

**REFERENCES:**

1. Ananth Grama, George Karypis, Vipin Kumar, and Anshul Gupta, "Introduction to Parallel Computing", Addison Wesley, Second Edition ,2003
2. M J Quinn, "Parallel Programming in C with MPI and OpenMP ",McGraw-Hill Higher Education, first edition, 2004.
3. D. Kirk and W. Hwu, "Programming Massively Parallel Processors", Snir, Otto, Huss- Lederman, Walker, and Dongarra, MPI The Complete Reference, The MIT Press, 1994
4. Ted G. Lewis and H. El-Rewini, "Introduction to Parallel Computing", Prentice-Hall, 1992
5. Ian Foster, "Designing and Building Parallel Programs", Addison Wesley, 1995
2. Van Luong, Nouredine Melab, and El-Ghazali Talbi, " GPU Computing for Parallel Local Search
3. Metaheuristic Algorithms",IEEE Transactions on Computers, vol. 62, no. 1, pages 173-185,
4. January 2013.
5. Junqing Sun and Gregory D. Peterson,"An Effective Execution

**Outcomes:**

- Express the need for parallel computing with its issues
- Acquire knowledge to design a parallel algorithm using decomposition and mapping techniques
- Interpret message passing paradigm for a parallel algorithm
- Design a parallel algorithm for an existing sequential problem
- Analyze the complexity and performance metrics of code when parallelization is done

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**(R15A0535) SEMANTIC WEB AND SOCIAL NETWORKS**  
**(Core Elective-IV)**
**Objectives:**

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

**UNIT –I: Web Intelligence**

Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

**UNIT -II: Knowledge Representation for the Semantic Web**

Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

**UNIT-III: Ontology Engineering**

Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

**UNIT-IV: Semantic Web Applications, Services and Technology**

Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

**UNIT-V: .Social Network Analysis and semantic web**

What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

**TEXT BOOKS:**

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

**REFERENCE BOOKS:**

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor, O'Reilly, SPD.

**Outcomes:**

- Ability to understand and knowledge representation for the semantic web
- Ability to create ontology
- Ability to build a blogs and social networks

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### (R15A0536) INTERNET OF THINGS (Core Elective-IV)

**Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- 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**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT

Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETCONF

**UNIT III**

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 IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)

Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**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:**

Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

[www.universityupdates.in](http://www.universityupdates.in) | [www.android.universityupdates.in](http://www.android.universityupdates.in)

**Outcomes:**

Upon completion of this course, students should be able to:

1. Explain the importance and usage of IOT.
2. Describe the various IOT levels and protocols.
3. Develop programs in Python.
4. Illustrate the functioning of IOT devices.
5. Relate IOT to cloud computing and web applications.

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**(R15A0590) DATA MINING AND DATA WAREHOUSING LAB****Objectives:**

Learn how to build a data warehouse and query it (using open source tools like Pentaho Data Integration and Pentaho Business Analytics), Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA), Understand the data sets and data preprocessing, Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression, Exercise the data mining techniques with varied input values for different parameters.

**LIST OF EXPERIMENTS:-**

Experiments using Weka &amp; Clementine Tools

1. Data Processing Techniques :  
(i) Data cleaning (ii) Data transformation - Normalization (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbour approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

**Outcomes:**

- Ability to add mining algorithms as a component to the existing tools
- Ability to apply mining techniques for realistic data.

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**(R15A0591) LINUX PROGRAMMING LAB****Objectives:**

- To write shell scripts to solve problems
- To implement some standard Linux utilities such as ls, cp etc using system calls.
- To develop network-based applications using C.

**List of Sample Problems:****Week 1:**

- Write a Shell Script that accepts a file name, starting and ending line numbers as arguments and displays all lines between the given line numbers.
- Write a shell script that deletes all lines containing the specified word in one or more files supplied as arguments to it.
- Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.

**Week 2:**

- Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or directory and reports accordingly. Whenever the argument is a file it reports no of lines present in it
- Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.

**Week 3:**

Write a shell script to list all of the directory files in a directory

Write a shell script to find factorial of a given number.

**Week 4:**

Write an awk script to count number of lines in a file that does not contain vowels

Write an awk script to find the no of characters ,words and lines in a file

**Week 5:**

Implement in c language the following Unix commands using system calls

- a) cat   b) ls   c) mv

**Week 6:**

Write a C program that takes one or more file/directory names as command line input and reports following information

- |                        |  |
|------------------------|--|
| A) File Type           | B) Number Of Links                     |
| C) Time of last Access | D) Read, write and execute permissions |

**Week 7:**

Write a C program to list every file in directory, its inode number and file name

**Week 8:**

- a) Write a C program to create child process and allow parent process to display “parent” and the child to display “child” on the screen
- b) Write a C program to create zombie process
- c) Write a C program to illustrate how an orphan process is created

**Week 9:**

- a) Write a C program that illustrate communication between two unrelated process using named pipes
- b) Write a C program that receives a message from message queue and display them

**Week 10:**

- a) Write a C program to allow cooperating process to lock a resource for exclusive use using Semaphore
- b) Write a C program that illustrate the suspending and resuming process using signal
- c) Write a C program that implements producer –consumer system with two processes using semaphores

**Week 11:**

Write client server programs using c for interaction between server and client process using Unix Domain sockets

**Week 12:**

Write a C program that illustrates two processes communicating using Shared memory

**Outcomes:**

- Ability to understand the Linux environment
- Ability to perform the file management and multiple tasks using shell scripts in Linux environment.

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### (R15A0537) INFORMATION SECURITY INCIDENT RESPONSE & MANAGEMENT (SECURITY ANALYST-III) (Core Elective-V)

#### Unit I

##### Managing Information Security Services:

Configuring Network Devices, Identifying Unauthorized Devices, Testing the Traffic Filtering Devices, Configuring Router, Configuring Modes — Router/Global/Interface/Line/Privilege EXEC/ROM/User EXEC, Configuring a banner/Firewall/Bastion Host/VPN server etc.

#### Unit II

##### Troubleshooting Network Devices and Services:

Introduction & Methodology of Troubleshooting, Troubleshooting of Network Communication-Connectivity- Network Devices-Network Slowdowns-Systems-Modems etc.

#### Unit III

##### Information Security Incident Management & Data Backup:

Information Security Incident Management overview-Handling-Response, Incident Response Roles and Responsibilities, Incident Response Process etc.

Data Backup introduction, Types of Data Backup and its techniques, Developing an Effective Data Backup Strategy and Plan, Security Policy for Backup Procedures.

#### Unit IV

**Log Correlation:** Computer Security Logs, Configuring & Analyzing Windows Logs, Log Management-Functions & Challenges, Centralized Logging and Architecture, Time Synchronization — NTP/NIST etc.

##### Develop Knowledge Skill and competences (NOS 9005)

#### Unit V

**Handling Network Security Incidents:** Network Reconnaissance Incidents, Network Scanning Security Incidents, Network Attacks and Security Incidents, Detecting DoS Attack, DoS Response Strategies, Preventing/stopping a DoS Incident etc.

##### Handling Malicious Code Incidents:

Incident Handling Preparation, Incident Prevention, Detection of Malicious Code, Containment Strategy, Evidence Gathering and Handling, Eradication and Recovery, Recommendations etc.

Project.

#### TEXT BOOKS:

1. Managing Information Security Risks, The Octave Approach by Christopher Alberts, and Audrey Dorofee
2. "Cryptography and Network Security (4th Edition) by (Author) William Stallings."

#### REFERENCES:

1. <https://www.sans.org/reading-room/whitepapers/incident/security-incident-handling-small-organizations-32979>

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### (R15A0538) PREDICTIVE ANALYTICS (ASSOCIATE ANALYTICS III) (Core Elective-V)

#### Unit I

##### Introduction to Predictive Analytics & Linear Regression (NOS 2101):

What and Why Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of data and variables, Data Modeling Techniques, Missing imputations etc.

Need for Business Modelling, Regression — Concepts, Blue property-assumptions-Least Square Estimation, Variable Rationalization, and Model Building etc.

#### Unit II

##### Logistic Regression (NOS 2101):

Model Theory, Model fit Statistics, Model Conclusion, Analytics applications to various Business Domains etc.

Regression Vs Segmentation — Supervised and Unsupervised Learning, Tree Building — Regression, Classification, Over fitting, Pruning and complexity, Multiple Decision Trees etc.

#### Unit III

##### Objective Segmentation(NOS 2101):

Regression Vs Segmentation — Supervised and Unsupervised Learning, Tree Building Regression, Classification, Over fitting, Pruning and complexity, Multiple Decision Trees etc.

**Develop Knowledge, Skill and Competences (NOS 9005) :** Introduction to Knowledge skills & competences, Training & Development, Learning & Development, Policies and Record keeping, etc.

#### Unit IV

##### Time Series Methods /Forecasting, Feature Extraction (NOS 2101):

Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average, Energy etc and Analyze for prediction.

#### Project

#### Unit V

##### Working with Documents (NOS 0703):

Standard Operating Procedures for documentation and knowledge sharing, Defining purpose and scope documents, Understanding structure of documents — case studies, articles, white papers, technical reports, minutes of meeting etc., Style and format, Intellectual Property and Copyright, Document preparation tools — Visio, PowerPoint, Word, Excel etc., Version Control, Accessing and updating corporate knowledge base, Peer review and feedback.

#### TEXT BOOK:

1. Student's Handbook for Associate Analytics-III.

#### REFERENCE BOOK:

1. Gareth James • Daniela Witten • Trevor Hastie Robert Tibshirani. An Introduction to Statistical Learning with Applications in R

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### (R15A0539) WEB SERVICES (Core Elective-V)

#### Objectives:

- To Understand the details of web services technologies: SOAP, WSDL, UDDI
- To learn how to implement and deploy web services clients and servers
- To explore interoperability between different frameworks
- To learn basic concepts of SOA.

#### UNIT I

**Evolution and Emergence of Web Services:** Evolution of distributed computing, Core distributed computing technologies, client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

**Introduction to Web Services:** The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

**Web Services Architecture:** Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services.

#### UNIT II

**Fundamentals of SOAP:** SOAP Message Structure, SOAP Encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, Limitations SOAP.

#### UNIT III

**Describing Web Services:** WSDL, WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

#### UNIT IV

**Discovering Web Services:** Service discovery, role of service discovery in a SOA, service discovery mechanisms, UDDI: UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, Publishing API, Publishing information to a UDDI Registry, searching information in a UDDI Registry, limitations of UDDI.

#### UNIT V

**Web Services Interoperability:** Means of ensuring Interoperability, Overview of .NET, Creating a .NET Client for an Axis Web Services, Creating Java Client for a web service, Challenges in Web Services Interoperability.

**Services Security:** XML security frame work, Goals of cryptography, Digital Signature, Digital Certificate, XML encryption.

**TEXT BOOKS:**

1. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, 2008.
2. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education, 2008.
3. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.

**REFERENCES:**

1. Building Web Services with Java, Second Edition, S. Graham and others, Pearson Edn., 2008.
2. Java web services ,D.A. Chappell and T.Jewell, O'Reilly,SPD.
3. Java Web Services Architecture, McGovern,Sameer Tyagi etal.,Elsevier.
4. Web Services, G. Alonso, F. Casati and others, Springer, 2005.

**Outcomes:**

- Basic details of WSDL, UDDI, SOAD
- Implement WS client and server with interoperable systems



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### (R15A0540) DATABASE SECURITY (Core Elective-V)

#### Objectives:

- To learn the security of databases
- To learn the design techniques of database security
- To learn the secure software design

#### UNIT- I

**Introduction:** Introduction to Databases Security Problems in Databases Security Controls Conclusions

**Security Models -1:** Introduction Access Matrix Model Take-Grant Model Acten Model PN Model Hartson and Hsiao's Model Fernandez's Model Bussolati and Martella's Model for Distributed databases

#### UNIT- II

**Security Models -2:** Bell and LaPadula's Model Biba's Model Dion's Model Sea View Model Jajodia and Sandhu's Model The Lattice Model for the Flow Control conclusion

**Security Mechanisms :** Introduction User Identification/Authentication Memory Protection Resource Protection Control Flow Mechanisms Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

#### UNIT- III

**Security Software Design :** Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

**Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

#### UNIT- IV

**Models For The Protection Of New Generation Database Systems -1:** Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Databases

#### UNIT- V

**Models For The Protection Of New Generation Database Systems -2: A**

Model for the Protection of New Generation Database Systems: the Orion Model Jajodia and Kogan's Model A Model for the Protection of Active Databases Conclusions

**TEXT BOOKS:**

1. Database Security by Castano *Pearson Edition* (1/e)
2. Database Security and Auditing: Protecting Data Integrity and Accessibility, 1st Edition, Hassan Afyouni, THOMSON Edition.

**REFERENCE BOOK:**

1. Database security by alfred basta, melissa zgola, CENGAGE learning.

**Outcomes:**

- Ability to carry out a risk analysis for large database.
- Ability to set up, and maintain the accounts with privileges and roles

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### (R15A0541) SCRIPTING LANGUAGES (Core Elective-VI)

**Objectives:**

- The course demonstrates an in depth understanding of the tools and the scripting languages
- Necessary for design and development of applications dealing with Bio- information/ Bio - data. The instructor is advised to discuss examples in the context of Bio-data/ Bio-information application development
- Relevant program capabilities are embedded in the learning outcomes for this course. In meeting these learning outcomes you will gain or improve your capabilities in: Enabling Knowledge: effectively apply knowledge of Perl, Python, PHP and TCL/Tk to new situations and learn from the experience.
- The main objective of this advanced course is assisting Perl programmer or database administrator to compile large programming set. Other tasks include implementing complex data structure, compiling object-oriented programming.
- Incorporate PHP into HTML files, Write basic PHP scripts, Process form input, Write and use functions. The advanced PHP training course further develops the skills of experienced PHP Programmers by introducing them to advanced techniques, tools, and methodologies that can be used to build complex, scalable, PHP applications.
- The goal of this course is to teach students the skills required to write Taylor Control Language (TCL) sequences using fundamental and advanced language features.

**UNIT I**

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages. Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines, advance perl -finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

**UNIT II****PHP Basics**

PHP Basics - Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Datatypes, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

### **UNIT III**

#### **Advanced PHP Programming**

Php and Web Forms, Files, PHP Authentication and Methodologies-Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World –Translating Websites- Updating Web sites Scripts, Creating the Localization Repository, Translating Files, text, Generate Binary Files, Set the desired language within your scripts, Localizing Dates, Numbers and Times

### **UNIT IV**

#### **TCL –Tk**

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL-eval, source, exec and up level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

### **UNIT V**

#### **Python**

Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling, Integrated Web Applications in Python –Building Small, Efficient Python Web Systems ,Web Application Framework.

#### **TEXT BOOKS:**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3<sup>rd</sup> Edition, Jason Gilmore, Apress Publications (Dreamtech)

#### **REFERENCE BOOKS:**

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee
1. and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz, SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1, I.Bayross and S.Shah, The X Team, SPD.
5. Core Python Programming, Chun, Pearson Education.
6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.
8. Programming Perl, Larry Wall, T.Christiansen and J.Orwant, O'Reilly, SPD

9. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
10. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson).
11. Perl Power, J.P.Flynt, Cengage Learning.

**Outcomes:**

- Students will also learn to develop, maintain, and scale the performance of web sites using Smarty templates.
- Student will be able to identify database and environment modifications to use TCL.  
Develop, debug, test, and execute sequences using the Editor and Runtime Console Support.
- Develop TCL sequences that: Perform process control calculations, manipulate arrays, and access recipes.
- Monitor and access functional elements and access/modify sequence parameters.
- Tk is a platform-independent GUI framework developed for Tcl. From a Tcl shell (tclsh), Tk may be invoked using this command: package requires Tk.

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### (R15A0542) STORAGE AREA NETWORKS (Core Elective-VI)

#### Objectives:

- To understand storage area networks characteristics and components.
- To become familiar with the SAN vendors and their products
- To learn Fibre Channel Protocols and how SAN components use them to communicate with each other
- To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches Thoroughly learn Cisco SAN-OS features
- To understand the use of all SAN-OS Commands. Practice variations of SANOS features

#### UNIT I

Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications.

#### UNIT II

Concept of RAID and its components , Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system.

Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfills the need, Understand the appropriateness of the different networked storage options for different application environments .

#### UNIT III

List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures.

#### **UNIT IV**

Architecture of backup/recovery and the different backup/recovery topologies , replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities.

#### **UNIT V**

Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center. Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain .

Virtualization technologies, block-level and file-level virtualization technologies and processes. Case Studies, The technologies described in the course are reinforced with EMC examples of actual solutions. Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

#### **TEXT BOOKS:**

1. Information Storage and Management, EMC Corporation, Wiley.

#### **REFERENCES:**

1. Storage Networks: The Complete Reference, Robert Spalding, Ta McGraw Hill , Osborne, 2003.
2. Building Storage Networks, Marc Farley, Tata McGraw Hi Osborne, 2001.
3. Storage Area Network Fundamentals, Meeta Gupta, Pearso Education Limited, 2002.

#### **Outcomes:**

- Ability to demonstrate the storage area networks and their products
- Ability to provide the mechanisms for the backup/recovery

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

IV Year B. Tech CSE - II Sem

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**(R15A0543) SOFTWARE PROJECT MANAGEMENT  
(Core Elective-VI)****Objectives:**

- Understanding the specific roles within a software organization as related to project and process management
- Understanding the basic infrastructure competences (e.g., process modeling and measurement)
- Understanding the basic steps of project planning, project management, quality assurance, and process management and their relationships

**UNIT-I**

Conventional Software Management: The waterfall Model, Conventional Software Management Performance, evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation. Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

**UNIT-II**

Conventional And Modern Software Management: Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an interactive Process, Life Cycle Phases: Engineering and Production Stages Inception, Elaboration, Construction, Transition phases .

**UNIT-III**

Artifacts of the Process: The Artifact Sets. Management Artifacts, Engineering Artifacts, Programmatic Artifacts. Model Based Software Architectures: A Management Perspective and Technical Perspective.

**UNIT-IV**

Flows of the Process: Software Process Workflows. Inter Trans Workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic Status Assessments. Interactive Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating. Interaction Planning Process, Pragmatic Planning.

**UNIT-V**

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, and Evolution of Organizations. Process Automation Building Blocks, the Project Environment. Project Control and Process Instrumentation: Server Care Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations Pragmatic Software Metrics Automation.



**Text Books:**

1. Walker Rayce, "Software Project Management", 1998, PEA.
2. Henrey, "Software Project Management", Pearson.

**Reference Books:**

1. Richard H.Thayer." Software Engineering Project Management", 1997, IEEE Computer Society.
2. Shere K.D.: "Software Engineering and Management", 1998, PHI.
3. S.A. Kelkar, "Software Project Management: A Concise Study", PHI.
4. Hughes Cotterell, "Software Project Management", 2e, TMH. 88 5. Kaeron Conway, "Software Project Management from Concept to D

**Outcomes:**

At the end of the course, the student shall be able to:

- Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- Compare and differentiate organization structures and project structures.
- Implement a project to manage project schedule, expenses and resource with the application of suitable project management tools