

**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

COMPUTER SCIENCE AND ENGINEERING

**Department of
Computer Science and Engineering**

M.Tech Two Year Degree Course

(Applicable for the batch admitted from 2017-18)



GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)

Seshadri Rao Knowledge Village

GUDLAVALLERU - 521 356, Krishna District, Andhra Pradesh

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**VISION, MISSION
OF THE
COLLEGE & DEPARTMENT
PEOs & POs
ACADEMIC REGULATIONS
AND
CURRICULAR COMPONENTS**

VISION & MISSION OF THE COLLEGE

Vision

To be a leading institution of engineering education and research, preparing students for leadership in their fields in a caring and challenging learning environment.

Mission

- * To produce quality engineers by providing state-of-the-art engineering education.
- * To attract and retain knowledgeable, creative, motivated and highly skilled individuals whose leadership and contributions uphold the college tenets of education, creativity, research and responsible public service.
- * To develop faculty and resources to impart and disseminate knowledge and information to students and also to society that will enhance educational level, which in turn, will contribute to social and economic betterment of society.
- * To provide an environment that values and encourages knowledge acquisition and academic freedom, making this a preferred institution for knowledge seekers.
- * To provide quality assurance.
- * To partner and collaborate with industry, government, and R and D institutes to develop new knowledge and sustainable technologies and serve as an engine for facilitating the nation's economic development.
- * To impart personality development skills to students that will help them to succeed and lead.
- * To instil in students the attitude, values and vision that will prepare them to lead lives of personal integrity and civic responsibility.
- * To promote a campus environment that welcomes and makes students of all races, cultures and civilizations feel at home.
- * Putting students face to face with industrial, governmental and societal challenges.

VISION & MISSION OF THE DEPARTMENT

Vision

To be a Centre of Excellence in computer science and engineering education and training to meet the challenging needs of the industry and society.

Mission:

- * To impart quality education through well-designed curriculum in tune with the growing software needs of the industry.
- * To serve our students by inculcating in them problem solving, leadership, teamwork skills and the value of commitment to quality, ethical behavior & respect for others.
- * To foster industry-academia relationship for mutual benefit and growth.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

To make the graduates of M. Tech Programme in Embedded Systems

PEO-I : Identify, analyze and solve computing related and multidisciplinary engineering problems to fulfill the needs of industry and society.

PEO-II : Communicate effectively which helps to work in a team and practice the profession in accordance with professional ethics with societal responsibilities.

PEO-III: Pursue a successful career in academia, research, industry, government and have the ability for lifelong learning to fulfill their goals.

IV. PROGRAM OUTCOMES (POs)

PO-1 : An ability to independently carry out research /investigation and development work to solve practical problems.

PO-2 : An ability to write and present a substantial technical report/document.

PO-3 : Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

V. ACADEMIC REGULATIONS

Applicable for the students of M.Tech from the Academic Year 2017-18.

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of four academic years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 70 credits and the student shall have to complete the two year course work and earn all the 70 credits for the award of M.Tech Degree.

4. Attendance Regulations

- 4.1 A student shall be eligible to appear for Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester will be considered for genuine reasons such as medical grounds and participation in co-curricular and extra-curricular activities and shall be granted only after approval by the College Academic Committee. Student should submit application for medical leave along with medical certificate from a registered medical practitioner within three days from reporting to the class work after the expiry of the medical leave. In case of participation in co-curricular and extra-curricular activities, either in the college or other colleges, students must take prior written permission from HoD concerned and should also submit the certificate of participation from the organizer of the event within three days after the completion of the event. Only such cases will be considered for condoning attendance shortage.
- 4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.
- 4.4 A student will not be promoted to the next semester unless he satisfies the attendance requirement of the current semester. He may seek re-admission for that semester when offered next.
- 4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

- 4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.
- 4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses :

Each theory course shall be evaluated for a total of 100 marks, consisting of 40 marks for internal assessment and 60 marks for semester end examination.

Internal Assessment:

- i) Of 40 marks for internal assessment, 10 marks are for continuous assessment in the form of two assignments and 30 marks are based on two mid-term examinations.
- ii) Each assignment carries 10 marks and the average of two assignments shall be taken as the marks for continuous assessment.
- iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.
- iv) Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 30 marks.
- v) For the project based theory course, the distribution of 40 marks for internal evaluation shall be 20 marks for theory, based on two mid-term examinations and 20 marks for project. Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of two questions, each for 20 marks, with internal choice. All the questions need to be answered. Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 20 marks.

External Assessment:

- i) Semester End Examination will have 8 questions, each for 12 marks, out of which 5 questions are to be answered.
- ii) For the project based theory course, semester end examination will have three questions, each for 20 marks, with internal choice. All the questions need to be answered. There will be no external assessment for project component.

5.2 Laboratory Courses :

- i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 25 marks shall be for day-to-day performance (15 marks for day-to-day evaluation and 10 marks for Record) and 15 marks shall be evaluated by conducting an internal laboratory test towards the end of semester.
- ii) Semester end examination shall be conducted by an internal examiner and an external examiner for 60 marks.

5.3 (a) Seminar:

- i) For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh report towards the end of that semester and appear for evaluation by the committee.

(b) Term Paper:

- i) For term paper, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the research papers and submit it to the department in publication form towards the end of semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There shall be an internal evaluation for 100 marks in the form of viva-voce examination and assessment of paper and its presentation. There will be NO external evaluation.
- ii) If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of subsequent semester(s). He has to submit a fresh paper towards the end of that semester and appear for evaluation by the committee.

5.4 Project Work:

Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee.

- i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department / a Senior Faculty as Chairman and two other senior faculty members.
- ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.
- iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.
- iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.
- v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.
- vi) A candidate who has passed all the theory, laboratory, seminar and term paper examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.
- vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.
- viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.
- ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

- i. Excellent
- ii. Very Good
- iii. Good
- iv. Satisfactory
- v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

6. Criteria for Passing a Course and Award of Grades:

6.1 Criteria for Passing a Course:

- i) A candidate shall be declared to have passed in individual theory / laboratory course, if he secures a minimum of 50% aggregate marks (internal & semester end examination marks put together), subject to securing a minimum of 40% marks in the semester end examination.
- ii) The candidate shall be declared to have passed in seminar / term paper viva-voce if he secures 50% marks.
- iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.
- iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 Method of Awarding Letter Grade and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his performance, as per the grading system given below.

Theory /Elective /Laboratory /Seminar / Term Paper /Project Dissertation (%)	Grade Points	Letter Grade
≥90	10	O (Outstanding)
≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	6	B (Above Average)
< 50	0	F (Fail)

6.3 Calculation of Semester Grade Point Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as given below:

$$\text{SGPA} = \frac{\sum(\text{CR} \times \text{GP})}{\sum \text{CR}} \quad \text{for each semester.}$$

where CR = Credits of a course

GP = Grade Points awarded for a course

* SGPA is calculated for a candidate who passed all the courses in that semester.

6.4 Eligibility for Award of B.Tech Degree:

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

- Pursued a course of study for not less than two academic years and not more than four academic years.
- Registered for prescribed **70** credits and secured **70** credits.
- Students, who fail to complete their Two years Course of study within Four years or fail to acquire the prescribed **70** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

6.5 Calculation of Cumulative Grade Point Average (CGPA) for Entire Program:

The CGPA is calculated as given below:

$$\text{CGPA} = \frac{\sum(\text{CR} \times \text{GP})}{\sum \text{CR}} \quad \text{for entire program.}$$

where CR = Credits of a course

GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 Award of Division:

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of B.Tech Degree and shall be placed in one of the following grades:

CGPA	Class
≥ 7.5	First Class with Distinction
≥ 6.5 & < 7.5	First Class
≥ 6.0 & < 6.5	Second Class

7. Supplementary Examinations

- Supplementary examinations will be conducted once in a year along with regular examinations.

- ii) Semester end supplementary examinations shall be conducted till next regulation comes into force for that semester after the conduct of the last set of regular examinations under the present regulation.
- iii) Thereafter supplementary examinations will be conducted in the equivalent courses as decided by the Board of Studies concerned.

8. Re-admission Criteria

A candidate, who is detained in a semester due to lack of attendance has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college and by paying the required tuition fee and special fee in addition to paying an administrative fee of Rs. 1,000/-

9. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.Tech program only with the prior permission of the Principal of the College, provided such candidate shall follow the transitory regulations applicable to the batch he joins. An administrative fee of Rs.2,000/- per each year of break in study in addition to the prescribed tuition and special fees shall be paid by the candidate to condone his break in study.

10. Transitory Regulations

A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and he will be offered substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

11. Withholding of Results

If the student has not paid the dues, if any, to the College or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

12. Malpractices

- i) The Principal shall refer the cases of malpractices in internal assessment tests and semester end examinations to a malpractice enquiry committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.
- ii) Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder.

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

Nature of Malpractices / Improper conduct		Punishment
If the candidate		
1.a	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination.)	Expulsion from the examination hall and cancellation of the performance in that subject only.
b	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through Cell phones with any candidates 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 shall be cancelled.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for the examinations of the remaining subjects of that semester / year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination.	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 candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of 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 or around the examination hall or organises a walkout or instigates others to walkout or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the Officer-in-charge or any person on duty in or outside the examination hall of any of his relations or indulges in any other act of misconduct or mischief which results 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.	Expulsion from the examination hall 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 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. 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 to appear for the remaining examinations of the subjects of that semester. 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.	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. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and a police case is 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 referred to the Chief Superintendent of Examinations for future action towards suitable punishment.	

- iii) The involvement of the staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents related to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and appropriate disciplinary action will be taken after thorough enquiry.

13. Other Matters

- i) Deserving physically challenged candidates will be given additional examination time and a scribe based on the certificate issued by the concerned authority. Students who are suffering from contagious diseases are not allowed to appear either for internal or semester end examinations.
- ii) The students who participated in coaching / tournaments held at State / National / International levels through University / Indian Olympic Association during semester end external examination period will be promoted to subsequent semesters as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated 18-08-1994.
- iii) The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the Departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the Departments shall be reported to the Academic Council for ratification.

17. General

- i) The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and /or syllabi.
- ii) The academic regulations should be read as a whole for the purpose of any interpretation.
- iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.
- v) Wherever the word he, him or his occurs, it will also include she, her and hers.

VI. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits
1	Baisc Sciences (BS)	3	4.28
2	Humanities and Social Sciences (HSS)	3	4.28
3	Professional Core (PC)	25	35.72
4	Professional Electives (PE)	9	12.86
7	Others (Seminar, Term Paper, Dissertation, etc.)	30	42.86

COURSE STRUCTURE

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SYLLABUS

COURSE STRUCTURE

I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1	MA2903	Statistics with R Programming	4	-	-	3
2	CS2901	Advanced Data Structures & Algorithm Analysis	4	-	-	3
3	CS2902	Wireless Networks	4	-	-	3
4	CS2903	Object Oriented Software Engineering	4	-	-	3
5	CS2904	Business Intelligence **	3	-	2	3
6		Professional Elective - I	4	-	-	3
7	CS2908	Advanced Data Structures & Algorithm and R Programming Lab	-	-	4	2
Total			23	-	6	20

II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Research Methodology	4	-	-	3
2	CS2909	Information Security	3	-	2	3
3	CS2910	Scripting Languages	4	-	-	3
4	CS2911	Data Analytics **	3	-	2	3
5		Professional Elective - II	4	-	-	3
6		Professional Elective - III	4	-	-	3
7	CS2917	Information Security & Scripting Languages Lab	-	-	4	2
8		Seminar	-	-	-	2
Total			23	-	6	22

** Project Based Theory Course

L : Lecture T : Tutorial P : Practical

III Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Term Paper	-	-	4	2
2		Dissertation (Initiated in third semester)	-	-	-	-
Total			-	-	4	2

IV Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No. of Periods per week			No. of Credits
			L	T	P	
1		Dissertation (Carried out in third & Fourth Semester)	-	-	52	34
Total			-	-	52	34

Professional Electives:

Professional Elective - I

- CS2905 Embedded Networking
- CS2906 Sensors and Actuators
- CS2907 Low Power CMOS Digital Design

Professional Elective - II

- CS2912 SoC Design
- CS2913 Embedded Real Time Operating Systems
- CS2914 Embedded System Design

Professional Elective - III

- CT2901 Advanced Computer Networks
- CS2915 Hardware Software Co-Design
- CS2916 Wireless Sensor Networks

SYLLABUS

STATISTICS WITH R PROGRAMMING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives:

To make the students

- with necessary statistical skills and techniques that are essential part of R programming.
- to write the R program and interpret the statistics to analyze and make decision to the data.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- install the R software and writing the R programming
- interpret the statistical data analysis with R programming.
- import, review, manipulate and summarize data-sets in R.
- perform appropriate statistical tests using R.
- create and edit visualizations with R

Course Content

UNIT - I: R Basics

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays.

UNIT –II: R Programming Structures

Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objects, No Pointers in R, Recursion, A Quick sort Implementation.

UNIT - III: Doing Math and Simulation in R

Math Function, Extended Example : Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.

UNIT - IV: Graphics

creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files.

UNIT - V: Probability Distributions, Statistics & Linear Models

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions, Basic Statistics, Correlation and Covariance, T-Tests, -ANOVA. Linear Models, Simple Linear Regression, Multiple Regression.

Text Books:

1. Norman Matloff, The Art of R Programming, Cengage Learning. (Units-2, 3, 4)
2. Lander, R for Everyone, Pearson (**Units-1, 5**)

Reference Books:

1. Paul Teetor, R Cookbook, Oreilly.
2. Rob Kabacoff, R in Action, Manning

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ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to familiarize with various types of data structures.
- to analyze the asymptotic performance of algorithms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- recognize the importance of algorithm analysis and analyze the performance of algorithms in terms of time and space complexities.
- apply different sorting and searching techniques on the given data and analyze their performance to pick up the best technique.
- construct binary trees and binary search trees for any given data and perform the basic operations such as insertion, deletion and search on them.
- recognize the use of AVL and B+ trees and perform the operations on them.
- explain graphs, representation of graphs using linked lists and adjacency matrices and perform graph traversals on any given graph.
- apply dynamic-programming paradigm to solve a class of problems.

Course Content

UNIT- I: Algorithm Analysis, Searching, Sorting

Preliminaries of Algorithm Analysis: Time and Space Complexity, Asymptotic Notations.

Searching: Linear and Binary Search Methods.

Sorting: Quick Sort, Merge Sort.

UNIT –II: Trees-I

Binary Trees: Properties, Representation and Traversals, Expression Trees (Infix, Prefix, Postfix).

Binary Search Trees: ADT, Operations- Searching, Insertion, Deletion, Implementation.

UNIT – III: Trees-II

AVL Trees: Introduction, Operations- Insertion, Deletion and Searching.

B+ Trees: Introduction, Operations-Insertion, Deletion and Search.

UNIT- IV: Graphs & Hashing

Graphs: Basic Concepts, Representation and Traversals, Minimum Cost Spanning Trees – Prim’s & Kruskal’s Methods.

Hashing: Hash Table Representation, Hash functions, Collision Resolution- Separate Chaining, Open Addressing-Linear Probing, and Double Hashing.

UNIT –V: Dynamic Programming

Introduction, Matrix Chain Multiplication, Optimal Binary Search Trees, Travelling Sales Person Problem, 0/1 knapsack problem.

Text Books:

1. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Second Edition. Cengage publications. (Units-2, 3, 4)
2. Ellis Horowitz, Satraj Sahni and Rajasekharam, "Fundamentals of Computer Algorithms", Galgotia publications pvt. Ltd. (Units-1, 4, 5)

Reference Books:

1. Allen Weiss, "Data structures and Algorithm Analysis in C", Second edition, Pearson education.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, "Introduction to Design and Analysis of Algorithms A strategic approach", Mc Graw Hill.

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WIRELESS NETWORKS

I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- to gain knowledge of the underlying networking technologies, architectures and protocols
- understand the routing algorithms in wireless networks
- analyze existing network protocols and networks.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Understand state-of-the-art wireless technologies. ·
- Apply the routing algorithms in any large scale dynamic networks. ·
- Design the wireless sensor applications
- Apply the Data retrieval techniques in wireless networks
- Design and simulation the wireless network applications.
- Design a secure Ad Hoc and wireless sensor networks.

Course Content

UNIT- I: Introduction

Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc wireless networks, characteristics of MANETs, applications of MANETs, issues and challenges of MANETs.

Routing in MANETs- Classification of routing protocols, topology- based versus position – based approaches, topology based routing protocols; position based routing.

UNIT-II: MANETs

Data Transmission in MANETs – The broadcast stream, multicasting, Geocasting, TCP over Ad Hoc Networks- TCP protocol overview, TCP and MANETs, solutions for TCP over Ad Hoc Networks.

Security in MANETs – Security in Ad Hoc wireless networks, key management, secure routing, cooperation in MANETs.

UNIT - III: Wireless Sensor Networks

Basics of Wireless Sensors and Applications – The mica mote, sensing and communication range, design issues, energy consumption, clustering of sensors, applications.

Data Retrieval in Sensor Networks – Classification of WSNs, MAC layer, routing layer, high-level application layer support, adapting the Inherent dynamic nature of WSNs.

UNIT - IV: Sensor Network Platforms and Tools

Sensor Node Hardware, Sensor Network Programming challenges, Node- Level Software Platforms, Node- Level simulators.

UNIT –V: Security in WSNs

Security in wireless sensor networks, key management in wireless sensor networks, secure data aggregation in wireless sensor networks, introduction to vehicular Ad Hoc networks, introduction to wireless mesh networks.

Text Books:

1. Carlos de Morais Cordeiro and Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications” , World Scientific Publications / Cambridge University Press, 2006. (Units- 1,2)
2. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Elsevier Science Imprint, MK Publishers, 2005. (Units- 1,2,3,4,5)

Reference Books:

1. C. Siva Ram Murthy and B.S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols” , Pearson Education, 2004.
2. Sudip Misra, Issac Woungang, and Subhas Chandra Misra, “Guide to Wireless Ad Hoc Networks”, Springer International Edition, 2011.
3. Sudip Misra, Issac Woungang, and Subhas Chandra Misra, “Guide to Wireless Sensor Networks” , Springer International Edition, 2012.
4. Thomas Krag and Sebastin Buettrich, “Wireless Mesh Networking”, O’ Reilly Publishers, 2007.

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OBJECT ORIENTED SOFTWARE ENGINEERING

I Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to gain knowledge of real time software development process.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Understand basic concepts of software engineering and software problems.
- Choose appropriate software development life cycle model for developing software product.
- Prepare a document for different artifacts of the software engineering process.
- Design and implement a software product.
- Conduct project closure activities and obtain formal project acceptance.

Course Content

UNIT- I: Introduction, Software Processes

Introduction to software Engineering: software, software crisis, Evolution of software engineering methodologies, software engineering challenges, software engineering principles.

Software Processes: software process, process classification, phased development life cycle, software development process models.

UNIT- II: Requirements Engineering

software requirements, Requirements engineering process, Requirements elicitation, structured analysis, data-oriented analysis, object-oriented analysis, prototyping analysis, SRS document, Requirements validation, Requirements management.

UNIT- III: Software Design

software design process, characteristics, design principles modular design, software architecture, design methodologies, structured design, structured design methodology, detailed design, design verification, Object-oriented analysis and design, object-oriented concepts.

UNIT - IV: Modelling

importance of modelling, principles of modelling, object-oriented modelling. Introduction to UML: overview of the UML, conceptual model of the UML, Architecture.

UML Diagrams- Use case diagram, class diagram, Object diagram, sequence diagram, Collaboration diagram, State chart Diagram, Activity diagram ,Component diagram, Deployment diagram.

UNIT - V: Software Project management

project management essentials, project management team, project life cycle, project management process, software configuration management, risk management.

Project planning and Estimation: project planning activities, software metrics and measurements, project size estimation, effort estimation techniques, staffing and personnel planning, project scheduling and milestones.

Text Books:

1. Ugrasen suman," Software Engineering Concepts and Practices", Cengage learning. (Units-1, 2, 3, 5)
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language", Pearson. (Unit-4)

Reference Books:

1. Ivica Crnkovic, "Component-based Software Engineering", 7th international symposium, CBSE 2004, Springer.
2. Stephen R. Schach,"Object Oriented and Classical Software Engineering", 7/e, TMH
3. Timothy Lethbridge, Robert Laganieri,"Object oriented and Classical Software Engineering", TMH

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BUSINESS INTELLIGENCE

I Semester

Lecture	: 3	Practical	: 2	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

To make the students

- to design and build a Business Intelligence solution.
- to acquire knowledge on how to design BI solutions for different BI targets.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- understand the need of Business Intelligence.
- analyze the appropriate Data warehouse technique for Business Intelligence.
- apply data mining techniques in Business Intelligence.
- apply various reporting techniques to take an appropriate decision.

Course Content

UNIT- I: Introduction to Business Intelligence

Effective and timely decisions- Data, information and knowledge- Role of mathematical models- Business intelligence architectures: Cycle of a business intelligence analysis- Enabling factors in business intelligence projects- Development of a business intelligence system- Ethics and business intelligence.

UNIT –II: Data Warehousing for BI

Definition and concepts, Data warehouse architecture, ETL process, data warehouse development, drill down, drill up, Data Mart vs.EDW, Implementation issues, Real-time data warehousing.

UNIT- III: Analytics for BI

Classification, Association rule mining, Clustering, Text Mining, Web Mining.

UNIT-IV: BI Applications

Marketing Models: Relational Marketing, Salesforce Management, Business case studies.

UNIT-V: Knowledge Delivery

Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated analytics, Considerations: Optimizing the presentation for the Right message.

Text Books:

1. Carlo Verrellis, "Business Intelligence : Data Mining and Optimization for Decision Making", Wiley Publications, 2009. (Units-1, 2, 3)
2. Efraim Turban, Jay E Aronson, Teng-Peng Liang, Ramesh Sharda, "Decision Support Business Intelligence Systems", 8th Edition, Pearson.(Units -1, 4, 5)

Reference Books:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" 2nd edition.
2. David Loshin Morgan Kaufman, "Business Intelligence: The Savvy Manager's Guide", Second Edition, 2012. (Units-2,3)
3. Larissa T. Moss, S.Atre, "Business Intelligence Roadmap: The complete Project Life Cycle of Decision Making", Addison Wesley, 2003.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill, 2007.

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Professional Elective - I

ADVANCED COMPUTE ARCHITECURE I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- to impart knowledge on advanced design issues of computer architecture.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply appropriate addressing mode for increasing the level of parallelism.
- choose appropriate software or hardware techniques for parallelism.
- design a strategy for reducing the cache miss rate.
- analyze various problems associated with interconnecting networks.

Course Content

UNIT- I: Fundamentals of Computer Design

Fundamentals of Computer design, technology trends, cost, measuring and reporting performance quantitative principles of computer design.

UNIT- II : Instruction Set

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)

overcoming 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 Books:

1. John L. Hennessy & David A. Patterson, “Computer Architecture A Quantitative Approach” , Morgan Kufmann (An Imprint of Elsevier), 3rd edition (Units-1,2,3,4,5)

Reference Books:

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

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Professional Elective - I

DIGITAL IMAGE PROCESSING I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- to describe and explain basic principles of digital image processing
- to discuss various image processing techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use appropriate image enhancement technique to improve the quality of an image.
- apply suitable image segmentation technique for an application.
- analyze various image compression techniques.
- apply morphological operations to modify the structure of an image.

Course Content

UNIT- I: Basics of Image Processing

Introduction- Digital image processing, examples of fields that use digital image processing, fundamental steps in digital image processing.

Digital Image Fundamentals- Image sensing and acquisition, sampling and quantization, basic relationships between pixels.

UNIT- II: Image Enhancement in the Spatial Domain

introduction, Basic gray-level transformations, histogram processing, enhancement using arithmetic and logic operators. basics of spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods.

UNIT –III: Color Image Processing

Introduction, color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transformations, color image smoothing and sharpening, color segmentation.

UNIT –IV: Image Compression

Fundamentals, image compression models, error-free compression, lossy predictive coding.

UNIT- V: Morphological Image Processing & Image Segmentation

Morphological Image Processing- Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms

Image Segmentation: Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation.

Text Books:

1. Rafeal C.Gonzalez, Richard E.Woods, “Digital Image Processing”, 2nd Edition, Pearson Education/PHI. (Units-1, 2, 3, 4, 5)

Reference Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 2nd Edition, Thomson Learning.
2. Adrian Low, “Computer Vision and Image Processing”, 2nd Edition, B.S.Publications
3. William K. Prat, “Digital Image Processing”, Wily 3rd Edition
4. B. Chanda, D. Datta Majumder, “Digital Image Processing and Analysis”, Prentice Hall of India, 2003.

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Professional Elective - I

E-COMMERCE

I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize the basic and advanced functions of e-commerce.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the risks involved in e-payment systems
- analyze the reasons for adoption of e-commerce and e-business.
- analyze the business challenges related to e-business and e-commerce for an organisation.
- design an e-business application.
- market their products in online.

Course Content

UNIT -I: Introduction

Introduction, E-commerce or Electronic Commerce- An Overview, Advantages and Disadvantages, Electronic Commerce – Cutting edge, Electronic Commerce Framework.

UNIT- II: Infrastructure of Network and E-Commerce

Network Infrastructure: Introduction, Network Infrastructure- An Overview, The Internet Hierarchy, Basic Blocks of e-commerce, Networks layers & TCP/IP protocols, The Advantages of Internet, World Wide Web.

E-commerce Infrastructure: Introduction, E-commerce Infrastructure- An Overview, Hardware, Software, Server Operating System.

UNIT –III: Process Models & EDI

E-Commerce Process Models: Introduction, Business Models, E-business Models Based on the Relationship of Transaction Parties, e-commerce Sales Life Cycle (ESLC) Model.

Electronic Data Interchange(EDI): The Meaning of EDI, History of EDI, EDI Working Concept, Implementation difficulties of EDI, Financial EDI, EDI and Internet.

UNIT- IV: Payment Systems and Risks

Electronic Payment Systems: Introduction, Electronic Cash, Smart Cards and Credit Card /Debit Card Based Electronic Payment Systems, Risks in Electronic Payment Systems.

Management of Risk: Introduction, Disaster Recovery Plans, Risk Management Paradigm.

UNIT- V: E-Marketing & its Future

The scope of E-Marketing, Internet Marketing Techniques.

Website Design Issues: Factors that Make People Return to Your Site, Strategies for Website Development.

Future Directions: Software Agents, Technology Behind Software Agents, Types of Software Agents, Characteristics and Properties of Software Agents, Framework for Software Agent-based e-commerce, m-commerce - Architecture, Areas of Potential Growth and Future for m-commerce.

Text Books:

1. Kenneth C.Laudon, carol guercio traver , “E-Commerce: Business, Technology, Society”, 4/e. (Units-1, 2, 3, 5)
2. Kalakata, Whinston, “Frontiers of electronic commerce” , Pearson. (Units-3, 4)

Reference Books:

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, “E-Commerce fundamentals and applications”.
2. S.Jaiswal, “E-Commerce”, Galgotia.
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, “E-Commerce”.
4. Gary P.Schneider & Thomson, “Electronic Commerce”.

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ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS AND R PROGRAMMING LAB

I Semester

Practical : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

- To impart practical knowledge about data structures and R programming.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop programs for various types of data structures.
- implement basic concepts using R programming.

PART - I

Data Structures and Algorithms

1. Perform different types of searching techniques on a given list
 - (i) Sequential search
 - (ii) Binary search
2. Perform different types of sorting on a given list
 - (i) Quick sort
 - (ii) Merge sort
3. Perform various operations on Binary search tree.
4. Perform operations on AVL trees.
5. Implement BFS and DFS Graph Traversals.
6. Implement dictionaries using hashing techniques.

PART - II

R-Programming

1. Write a function to display the contents of a call Frame.
2. Write a program to implement Quick sort with recursion.
3. Write a program to calculate the probability. Suppose we have n independent events, and the i th event has the probability p_i of occurring. What is the probability of exactly one of these events occurring.
4. Write a program to calculate the vector cross product.

5. Write a program for reading and writing files.
6. Write a program to draw the graph for the function $f(x) = 1 - e^{-x}$ and adds a rectangle that approximates the area under the curve $x=1.2$ to $x=1.4$.
7. Write a program using linear regression to predict sons' height using fathers' height.
8. Write a program to create graphs and use of `plot()` function in R.

Reference Books and URL's:

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, "Fundamentals of Computer Algorithms", Galgotia publications pvt. Ltd.
2. Norman Matloff, The Art of R Programming, Cengage Learning.
3. Lander, R for Everyone, Pearson Publications
4. <https://www.tutorialspoint.com/r/>
5. <https://www.programiz.com/r-programming>.

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RESEARCH METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- familiarize with the objectives, motivation and significance of research.
- know research methodologies.
- define research problem and perform data analysis.
- write a research paper and report.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- understand research approaches
- understand various research methodologies
- define a research problem
- perform data analysis
- write research papers and reports

Course Content

UNIT – I: Introduction

Introduction, objectives and motivation of research, types of research, research approaches, significance of research methods.

UNIT – II: Research Methodology

Research methods versus methodology, research and scientific method, importance of knowing how research is done, research process. criteria for good research.

UNIT – III: Defining Research Problem

The research problems, necessity of defining the problem, technique involved in defining a problem, review of related literature, purpose of literature survey, identifying the current status, presentation of literature survey findings. critique, survey and peer review process.

UNIT – IV: Research Design and Data Analysis

Meaning of research design, features of good design, important concepts relating to research design, different research designs, basic principles of experimental designs.

Methods of data collection - collection of primary data, observation method, interview method, collection of data through questionnaires, collection of data through schedules, difference between questionnaires and schedules, some other methods of data collection, collection of secondary data, selection of appropriate method for data collection, case study method.

Processing and analysis of data - processing operations, some problems in processing, elements, types of analysis, statistics in research.

UNIT – V: Research Paper and Report Writing

Final paper presentation. significance of report writing, different steps in writing report, layout of the research report, types of report, precautions for writing research reports.

Text Books:

1. C.R.Kothari, "Research Methodology Methods and Techniques", Wishwa Prakashan Publishers, Second Edition. **(Units- 1,2,3,4,5)**

Reference Books:

1. Template of ASCE/ASME/IEEE for paper writing.

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INFORMATION SECURITY

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to familiarize basic concepts, principles, and mechanisms when designing a secure system.
- to assess threats for their significance, and how to gauge the protections and limitations provided by today's technology.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- familiar with information security and a clear understanding of its importance.
- differentiate various cryptographic techniques such as conventional and modern encryption techniques.
- analyze the various security issues over networks.
- apply security mechanisms for software applications and web applications.
- master in information security governance, and related legal and ethical issues.

Course Content

UNIT- I: Classical Encryption Techniques

Introduction: Security attacks, services & mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques.

UNIT- II: Symmetric Key Cryptography

Traditional Block Cipher Structure, DES, AES, Blowfish, IDEA, Block Cipher Modes of Operations.

Asymmetric Key Cryptography: Principles, public key cryptography algorithm: RSA Algorithm, Diffie Hellman Key Exchange.

UNIT –III: Network Security

TCP/IP security issues, DNS security issues and defences, TLS/SSL, Network Intrusion detection and prevention systems, Firewalls.

UNIT- IV: Software & Web Security

Software Security - Vulnerability auditing, penetration testing, Sandboxing, Control flow integrity. **Web Security** - User authentication, authentication-via-

secret and session management, Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

UNIT –V: Legal and Ethical Issues

Cybercrime and computer crime, Intellectual property, copyright, patent, trade secret, Hacking and intrusion, Privacy, identity theft.

Text Books:

1. William Stallings, "Cryptography & Network Security: Principles and Practices", PEA, Sixth edition. (Units-1, 2)
2. Matt Bishop, "Computer Security: Art and Science" 2nd Edition. (Units-3, 4, 5)

Reference Books:

1. Keith Martin, "Everyday Cryptography, Fundamental Principles & Applications", Oxford
2. Bernard Menezes, "Network Security & Cryptography", Cengage, 2010
3. Chwan Hwa Wu, J. David Irwin, "Introduction to Computer Networks & Cyber Security", CRC press.

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SCRIPTING LANGUAGES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to provide students with the knowledge and ability to write computer scripts using client and server-side scripting languages commonly used on the web to interact with and dynamically generate HTML code.
- to develop web applications using scripting languages which solve client and server side problems with good connectivity.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- gain the skills and project-based experience needed for entry into web design and development careers.
- identify good candidate administrative functions for scripting.
- understand the benefits and challenges of scripting.
- write basic PHP scripts that process user input from a web form.
- integrate PHP with AJAX.
- create a simple CGI script in Perl.

Course Content

UNIT- I: Introduction to Python

Features of Python, Installing Python, Running Python, Program Input /Output, Comments, Operators, Variables, Python Types, Indentation, Conditionals, Loops.

UNIT – II: Functions and classes in Python

Functions, Classes, Modules, Strings, Tuples, Lists.

UNIT- III : PHP

Introduction, Creating and running a PHP Script, Using variables, constants, Data types and Operators. Control statements, Arrays and Functions.

UNIT – IV: Working with Forms and Databases using PHP

Forms: Processing a Web form, Validating a Web Form and Enforcing data rules.

Using PHP and MySQL: Introduction to MySQL, Connecting to MySQL Server using PHP and performing Select, Insert, Delete, Alter and Update operations.

UNIT –V: AJAX A New Approach

Introduction, Creating XMLHttpRequest object, Integrating AJAX with PHP, Retrieving data from a database using PHP and AJAX.

WEB Services in AJAX: Introduction to web services, architectures of *Simple Object Access Protocol* (SOAP), Web Services Description Language (WSDL), *Universal Description, Discovery and Integration* (UDDI).

Text Books :

1. Wesley J. Chun, “Core Python Programming”, Prentice Hall PTR (**Units- 1,2**)
2. Kogent Learning Solutions, “Web Technologies, Black book”, Dreamtech press. (**Units- 3,4,5**)

Reference Books:

1. Uttam K Roy, “Web Technologies”, Oxford
2. Chris Bates, WILEY, “Web Programming: building internet applications”, Dreamtech, 2nd edition.
3. Robert W Sebesta , “Programming the World Wide Web”, Pearson publications, Fourth edition

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DATA ANALYTICS

II Semester

Lecture	: 3	Practical	: 2	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

To make the students

- to familiarize the fundamental concepts of Apache Hadoop (Big data framework).
- to gain knowledge of HDFS file system, Map Reduce frameworks and relevant tools.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- know the fundamentals of Big data and architecture of Hadoop
- use HDFS file structure and Map reduce frameworks to solve complex problems.
- analyze relational data in a Hadoop environment using Hive and Pig tools.

Course Content

UNIT- I: Introduction to Big Data

what is Big Data. why Big Data is important, data, data storage and analysis, comparison with other systems, brief history of Hadoop, apache Hadoop and the Hadoop eco system. LINUX refresher; VM Ware installation of Hadoop.

UNIT - II : The Hadoop Distributed File System

The design of HDFS, HDFS concepts, HDFS Architecture, command line interface to HDFS, Hadoop file systems, interfaces, java interface : Reading and writing Data using file system API , anatomy of a file read, anatomy of a file write, replica placement.

UNIT – III: Introduction to MapReduce

Introduction, analyzing weather data set with unix tools, analyzing weather dataset with hadoop, java map reduce classes ,data flow, combiner functions, running distributed map reduce job, configuration API, managing configuration, the Map Reduce WebUI.

UNIT – IV: Working of MapReduce

Classic map reduce, job submission, job initialization, task assignment, task execution, progress and status updates, job completion, shuffle and sort on map and reducer side, input formats, output formats .

UNIT –V: Hive & Pig

The Hive Shell, Hive services, Hive clients, the meta store, comparison with traditional databases, Hive QL, pig execution types, running pig programs, Pig Latin structures , statements, expressions, types , schemas , functions.

Text Books:

1. Tom White, “Hadoop - The Definitive Guide”, 3rd Edition, O’Reilly Publications, 2012. (Units-1, 2, 3, 4, 5)
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch ,”Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, 1st Edition, TMH,2012. (Units-1)

Reference Books:

1. Frank J.Ohlhorst, “Big Data Analytics: Turning Big Data Into Big Money”, 2nd edition, TMH,2012.

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Professional Elective - II

ADVANCED OPERATING SYSTEMS II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- to learn the fundamentals of operating systems
- to gain knowledge on distributed operating system concepts that includes architecture, mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
- to gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- to know the components and management aspects of real time, mobile operating systems

Learning Outcomes

Upon successful completion of the course, the students will be able to

- discuss the various synchronization, scheduling and memory management issues
- demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- discuss the various resource management techniques for distributed systems
- identify the different features of real time and mobile operating systems

Course Content

UNIT-I: Fundamentals of Operating Systems

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT –II: Distributed Operating Systems

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT -III : Distributed Resource Management

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous, Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol.

UNIT - IV : Real Time Systems

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing.

UNIT- V: Mobile Operating Systems

Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

Text Books :

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001. **(Units- 1,2,3,4)**
2. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006. 5. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011. **(Units- 5)**

References Books:

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
2. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005.

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Professional Elective - II

MACHINE LEARNING

II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- understand a wide variety of learning algorithms.
- understand how to apply a variety of learning algorithms to data.
- understand how to perform evaluation of learning algorithms and model selection

Course Outcomes:

Upon successful completion of the course, the students will be able to

- develop an appreciation for what is involved in learning from data.
- analyze different classifications and regression
- build the learning model.
- apply machine learning algorithms to solve problems of moderate complexity.
- formulate machine learning problems corresponding to different applications.

Course Content

UNIT- I : Introduction to Machine Learning

Why Machine learning, Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks.

Machine learning Models: Geometric Models, Logical Models, Probabilistic Models.

Features: Feature types, Feature Construction and Transformation, Feature Selection.

UNIT -II :Classification and Regression

Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting-Catalysts for Overfitting, Case study of Polynomial Regression

UNIT- III :Linear Models

Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity

UNIT- IV: Logic Based and Algebraic Models

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based Clustering-K-Means Algorithm, Hierarchical Clustering,

Rule Based Models: Rule learning for subgroup discovery, Association rule mining

Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.

UNIT- V :Probabilistic Models

Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models

Text Books

1. Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, Cambridge University Press, Edition 2012. (Units- 2,3,4,5)
2. Hastie, Tibshirani, Friedman, “Introduction to Statistical Machine Learning with Applications in R”, Springer, 2nd Edition-2012. (Units - 1)

Reference Books

1. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer 1st Edition-2013.
2. Ethem Alpaydin, “Introduction to Machine Learning”, PHI 2nd Edition-2013.
3. Parag Kulkarni, “Reinforcement and Systematic Machine Learning for Decision Making”, Wiley-IEEE Press, Edition July 2012.

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Professional Elective - II

SOFTWARE TESTING METHODOLOGIES

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- to learn how to design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Understand the myths and facts of software testing.
- Analyze and design test cases using black box testing technique which includes decision tables domain testing and graph-based testing.
- Apply path testing on any given program and uncover bugs present in the program.
- Distinguish between verification and validation.
- Select the appropriate tests to regression test your software after changes have been made.
- Understand the need of automated testing tools and various kinds of automated testing tools.

Course Content

UNIT-I: Introduction

Introduction, Myths & Facts, Goals, Model for testing, Effective Vs Exhaustive Software Testing. **Software Testing Terminology And Methodology:** Software Testing Terminology, Software Testing Life Cycle.

UNIT-II: Dynamic Testing I

Black Box Testing Techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing.

UNIT-III: Dynamic Testing I

White-Box Testing Techniques: Need, Logic coverage criteria, Basis path testing, Loop testing, mutation testing **Static Testing:** Inspections, Structured Walkthroughs, Technical reviews.

UNIT-IV: Verification And Validation

Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify code, Validation, Validation Activities

UNIT-V: Regression Testing

Objectives of regression testing, When regression testing done? Regression testing types, Regression testing techniques

Software Quality Management: Software Quality metrics, SQA models, Debugging: process, techniques, correcting bugs.

Automation And Testing Tools: Need for automation, categorization of testing tools, selection of testing tools, Cost incurred, overview of some commercial testing tools.

Text Books:

1. Software Testing, Principles and Practices, Naresh Chauhan, Oxford (Units-1,2,3,4,5)

Reference Books:

1. Baris Beizer, "Software Testing Techniques", International Thomson computer press, second edition.
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson Software Testing- Yogesh Singh, CAMBRIDG.

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Professional Elective - III

CLOUD COMPUTING

II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- To gain knowledge Virtualization, Virtual Machine and different models of VM.
- To familiarize Cloud computing architecture and its security aspects.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish Virtualization and Virtual Machine, physical and virtual networks.
- know Cloud Scale and value of Cloud Computing.
- apply various disaster management techniques.
- design a Cloud for an Enterprise.

Course Content

UNIT – I: Introduction

Introduction to virtualization and virtual machine, virtualization in cluster / grid context virtual network, information model & data model for virtual machine, Software as a Service (SaaS), SOA, On Demand Computing (ODC).

UNIT – II: Cloud Computing

Introduction, what it is and what it isn't, from collaborations to cloud, cloud application architectures, value of cloud computing, cloud infrastructure models, scaling a cloud infrastructure, capacity planning, cloud scale.

UNIT - III : Data Center to Cloud

move into the cloud, know your software licenses, the shift to a cloud cost model, service levels for cloud applications.

UNIT- IV: Security

Disaster recovery, web application design, machine image design, privacy design, database management, data security, network security, host security, compromise response.

UNIT – V: Defining Clouds for the Enterprise

Storage-as-a-Service, Database-as-a- Service, Information-as-a-Service, Process-as-a-Service, Application-as-a- Service, Platform-as-a-Service, Integration-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service, Testing-as-a-Service Infrastructure-as-a-Service.

Text Books:

1. Michael Miller, “Cloud Computing – Web Based Applications That change the way you work and Collaborate Online”, Person Education. (Units- 1,2,3)
2. George Reese, “Cloud Application Architectures”, 1st edition, O’Reilly Media. (Units-4,5)

Reference Books:

1. David S. Linthicum, “Cloud Computing and SOA Convergence in your Enterprise : A Step-by-Step Guide”, Addison-Wesley Professional.
2. Kai Hwang, Geoffery C.Fox,Jack J, Dongarra,” Distributed & Cloud Computing From Parallel Processing to the Internet of Things”.

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Professional Elective - III

SOFT COMPUTING

II Semester

Lecture : 4

Internal Marks : 40

Credits : 3

External Marks : 60

Course Objectives

To make the students

- to gain knowledge on working of neural networks and its learning techniques, back propagation networks.
- to be familiar with Soft Computing techniques like GA, Fuzzy logic, Artificial Neural Network and their hybrid systems which are used for solving different problems and their applications.

Course Outcomes

Upon successful completion of the course, the students will be able to

- understand various soft computing techniques and its applications
- explain the architecture of Artificial neural networks and various learning techniques
- understand the working of Back propagation networks, back propagation algorithm and learning methods
- differentiate between fuzzy sets and crisp sets and can perform various operations on Fuzzy sets
- apply if-then rules on fuzzy sets and can interpret various fuzzy algorithms, Fuzzifications & Defuzzifications
- analyze working principle, procedures, representations of genetic algorithm and its applications

Course Content

UNIT- I: Introduction

Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

UNIT -II : Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

UNIT- III: Neural Networks-II (Back Propagation Networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient, Back Propagation algorithm, factors affecting back propagation training, applications.

UNIT- IV: Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT- V: Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfication & Defuzzification, Fuzzy Controller, Industrial applications.

Text Books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India. **(Units-1,2,3,4,5)**
2. N.P.Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press. **(Units- 2,3,4,5)**

Reference Books:

1. Siman Haykin, “Neural Networks” Prentice Hall of India
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
3. Kumar Satish, “Neural Networks” Tata Mc Graw Hill.

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Professional Elective - III

INTERNET OF THINGS

II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

To make the students

- to understand the fundamentals of Internet of Things.
- to build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- to apply the concept of Internet of Things in the real world scenario.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- design a portable IoT using Arduino/ equivalent boards and relevant protocols.
- develop web services to access/control IoT devices.
- deploy an IoT application and connect to the cloud.
- analyze applications of IoT in real time scenario.

Course Content

UNIT- I : FUNDAMENTALS OF IOT

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

UNIT- II : IOT DESIGN METHODOLOGY

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT -III : BUILDING IOT WITH RASPBERRY PI

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services.

UNIT- IV: BUILDING IOT WITH ARDUINO

Interfaces - Arduino IDE – Programming - APIs and Hacks.

UNIT- V: CASE STUDIES and ADVANCED TOPICS

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for IoT.

Text Books:

1. Arshdeep Bahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, 2015. (Units- 1,2,3,4,5)
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen (Units-4,5)

Reference Books:

1. Manoel Carlos Ramon, “Intel Galileo and Intel Galileo Gen 2:API Features and Arduino Projects for Linux Programmers”, Apress Open.
2. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

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INFORMATION SECURITY AND SCRIPTING LANGUAGES LAB

II Semester

Lecture : 4

Internal Marks : 40

Credits : 2

External Marks : 60

Course Objectives

To make the students

- to familiarize the implementation of various security algorithms.
- to provide students with the knowledge and ability to write computer scripts using client and server-side scripting languages.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- implement various security algorithms in computer networks
- Write basic Python and PHP scripts that process user input from a web form.
- Integrate PHP with AJAX.

PART - I

Information Security

1. Implement different substitution and transposition techniques.
2. Implement DES encryption & decryption algorithm.
3. Implement Diffie - Hellman key exchange algorithm.
4. Implement RSA algorithm to generate key
5. Use RSA algorithm to encrypt text data.
6. Use RSA algorithm to decrypt text data.
7. Implement any virus application.

PART-II

Scripting Languages

1. Write a python program to find the sum of all the primes below hundred.
2. Write a python program to find the sum of the even-valued terms in the Fibonacci sequence whose values do not exceed ten thousand.
3. Write a python program that accepts a string from a user and re-displays the same after removing vowels from it.
4. Write a python program to sort a Tuple of values.

5. Write a python program that scans an email address and forms a tuple of user name and domain name.
6. Write a python program to print sum and average of the elements present in the list.
7. Write a python program that forms a list of first character of every word present in another list.
8. Write a PHP program to validate the fields of the login page
9. Write a PHP program to insert the details entered by the user in the Registration form into database (MySQL)
10. Write a PHP program that displays the list of all registered users stored in the database
11. Write an AJAX program that uses the content of a text file dynamically.
12. Write an AJAX program that demonstrates the integration of PHP with AJAX.

Reference Books and URL's:

1. William Stallings, "Cryptography & Network Security: Principles and Practices", PEA, Sixth edition
2. Bernard Menezes, "Network Security & Cryptography", Cengage,2010
3. Wesley J. Chun, "Core Python Programming", Prentice Hall PTR
4. Kogent Learning Solutions, "Web Technologies, Black book", Dreamtech press.
5. https://www.w3schools.com/php/php_examples.asp
6. <https://www.javatpoint.com/php-example>
7. <https://www.programiz.com/python-programming/examples>

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