1. **Conditions for Admission**

Candidates for admission to the first year of the four-semester M.E / M.Tech Degree programme in Engineering shall be required to have passed B.E / B.Tech degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time. The admission for M.E Part Time programme is restricted to those working or residing within a radius of 90 km from Annamalainagar. The application should be sent through their employers.

2. **Branches of Study in M.E / M.Tech**

The Branch and Eligibility criteria of programmes are given in Annexure I.

3. **Courses of study**

The courses of study along with the respective syllabi and the scheme of Examinations for each of the M.E / M.Tech programmes offered by the different Departments of study in the Faculty of Engineering and Technology are given separately.

4. **Choice Based Credit System (CBCS)**

The curriculum includes three components namely Program Core, Program Electives and Open Electives, Mandatory Learning Courses and Audit Courses in addition to Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.

5. **Assignment of Credits for Courses**

Each course is normally assigned one credit per hour of lecture / tutorial per week and 0.5 credit for one hour of laboratory or project or industrial training or seminar per week. The total credits for the programme will be 68.

6. **Duration of the programme**

A student of M.E / M.Tech programme is normally expected to complete in four semesters for full-time / six semesters for part-time but in any case not more than four years for full-time / six years for part-time from the date of admission.

7. **Registration for courses**

A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and Phase-II shall be done at the appropriate semesters.
8. Electives

8.1 Program Electives
The student has to select two electives in first semester, another two electives in the second semester and one more in the third semester from the list of Program Electives.

8.2 Open Electives
The student has to select two electives in third semester from the list of Open Electives offered by the Department and / or other departments in the Faculty of Engineering and Technology.

8.3 MOOC (SWAYAM) Courses
Further, the student can be permitted to earn credits by studying the Massive Open Online Courses offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned. These courses will be considered as equivalent to open elective courses. Thus the credit earned through MOOC courses can be transferred and considered for awarding Degree to the student concerned.

8.4 Value added courses (Inter Faculty Electives)
Of the two open elective courses, a student must study one value added course that is offered by other Faculties in our University either in second or third semester of the M.E programme.

9. Industrial Project
A student may be allowed to take up the one program elective and two open elective courses of third semester (Full Time program) in the first and second semester, to enable him/her to carry out Project Phase-I and Phase-II in an industry during the entire second year of study. The condition is that the student must register those courses in the first semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

10. Assessment

10.1 Theory Courses
The break-up of continuous assessment and examination marks for theory courses is as follows:

First assessment (Mid-Semester Test-I) : 10 marks
Second assessment (Mid-Semester Test-II): 10 marks
Third Assessment                        : 5 marks
End Semester Examination                : 75 marks

10.2 Practical Courses
The break-up of continuous assessment and examination marks for Practical courses is as follows:

First assessment (Test-I) : 15 marks
Second assessment (Test-II): 15 marks
Maintenance of record book : 10 marks
End Semester Examination : 60 marks
10.3 Thesis work

The thesis Phase I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.

1. Seminar / Industrial Training

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of the seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

2. Student Counselors (Mentors)

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor (mentor) for those students throughout their period of study. Such student counselors shall advise the students in selecting open elective courses from, give preliminary approval for the courses to be taken by the students during each semester, and obtain the final approval of the Head of the Department monitor their progress in SWAYAM courses / open elective courses.

3. Class Committee

For each of the semesters of M.E / M.Tech programmes, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time and first to sixth semesters for Part-time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.
- All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.
The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory courses / 40 marks for practical courses, for Industrial Training and for Thesis work (Phase-I and Phase-II) will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

4. Temporary Break Of Study

A student can take a one-time temporary break of study covering the current semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire programme within the maximum period of four years for Full time / six years for Part time.

5. Substitute Assessments

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end of semester examination may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

6. Attendance Requirements

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate/concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.

7. Passing and declaration of Examination Results

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and cumulative grade point average (CGPA) and prepare the mark sheets.
A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

- S - 10;
- A - 9;
- B - 8;
- C - 7;
- D - 6;
- E - 5;
- RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

8. Awarding Degree

After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.

For First Class with Distinction the student must earn a minimum of 68 credits within four semesters for full-time / six semesters for Part time from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn a minimum of 68 credits within two years and six months for full-time / three years and six months for Part time from the time of admission and obtain a CGPA of 6.75 or above.
For Second class, the student must earn a minimum of 68 credits within four years for full-time / six years for Part time from the time of admission.

9. Ranking of Candidates

The candidates who are eligible to get the M.E. / M.Tech degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester for M.E. / M.Tech full-time / I to VI semester for M.E. / M.Tech part-time.

The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester for full-time / I to VI semester for M.E. / M.Tech part-time.

10. Transitory Regulations

If a candidate studying under the old regulations M.E. / M.Tech could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old regulations.

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Department</th>
<th>Programme (Full Time &amp; Part time)</th>
<th>Eligible B.E./B.Tech Programme</th>
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<td>ii. Power System</td>
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DEPARTMENT OF
INFORMATION TECHNOLOGY

VISION
To produce globally competent, quality technocrats, to inculcate values of leadership and research qualities and to play a vital role in the socio-economic progress of the nation.

MISSION

- To partner with the University community to understand the information technology needs of faculty, staff and students
- To develop dynamic IT professionals with globally competitive learning experience by providing high class education
- To involve graduates in understanding need based Research activities and disseminate the knowledge to develop entrepreneur skills

PROGRAMME EDUCATIONAL OBJECTIVES

1. Engineers will practice the profession of engineering using a systems perspective and analyze, design, develop, optimize & implement engineering solutions and work productively as engineers, including supportive and leadership roles on multidisciplinary teams.

2. Continue their education in leading graduate programs in engineering & interdisciplinary areas to emerge as researchers, experts, educators & entrepreneurs and recognize the need for, and an ability to engage in continuing professional development and life-long learning.

3. Engineers, guided by the principles of sustainable development and global interconnectedness, will understand how engineering projects affect society and the environment.

4. Promote Design, Research, and implementation of products and services in the field of Engineering through Strong Communication and Entrepreneurial Skills.

5. Re-learn and innovate in ever-changing global economic and technological environments of the 21st century.

M.E. (INFORMATION TECHNOLOGY)

PROGRAMME OUTCOMES (PO)

After the successful completion of the M.E. (Information Technology) degree programme, the students will be able to:

PO1: Apply knowledge of computing, mathematical foundations, algorithmic principles, and engineering theory in the modelling and design of systems to real-world problems (fundamental engineering analysis skills).

PO2: Apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline.
PO3: Design and conduct experiments, as well as to analyze and interpret data (information retrieval skills). Practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills.

PO4: Analyze a problem, identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution (engineering problem solving skills).

PO5: Understand the appropriate codes of practice and industry standards.

PO6: Identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.

PO7: Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues.

PO8: Communicate effectively, both in writing and orally (speaking / writing skills).

PO9: Understand professional, ethical, legal, security and social issues and responsibilities (professional integrity).

PO10: Formulate and solve moderately complex engineering problems, accounting for hardware/software/human interactions.

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## COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

**PROGRAM : M.E**

**SPECIALIZATION: INFORMATION TECHNOLOGY**

### SEMESTER I

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COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

PROGRAM : M.E

SPECIALIZATION: INFORMATION TECHNOLOGY

### SEMESTER III

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### COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

**PROGRAM : M.E (PART – TIME) SPECIALIZATION: INFORMATION TECHNOLOGY**

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# COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

**PROGRAM : M.E  SPECIALIZATION: INFORMATION TECHNOLOGY**

## SEMESTER VI

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35. ITITPESCN Digital Forensics
36. ITITPESCN Computer Vision

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ITITPC11 MATHEMATICS FOR COMPUTING

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<th>COURSE OBJECTIVES:</th>
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<td>To understand the mathematical fundamentals for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems and Machine learning.</td>
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<td>To develop many modern techniques in information technology like machine learning, programming language design and concurrency.</td>
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<td>To study various sampling and classification problems.</td>
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Probability mass, density and cumulative distribution functions, parametric families of distributions, expected value, variance, conditional expectation, applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov Chains.

Random samples, sampling distributions of estimators, methods of moments and Maximum Likelihood.


Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton Circuits, and Euler Cycles, Permutations and combinations with and without repetition, specialized techniques to solve combinatorial enumeration problems.

Computer Science and Engineering Applications: Data mining, network protocols, analysis of web traffic, computer security, software engineering, computer architecture, operating systems, distributed systems, bioinformatics, machine learning. Recent trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing and computer vision.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. To understand the basic notions of discrete and continuous probability
2. To understand the methods of statistical inference and the role that sampling distributions play in those methods.
3. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

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19
### COURSE OBJECTIVES:
- The student should be able to choose appropriate data structures, understand the
- ADT/libraries, and use it to design algorithms for a specific problem.
- Students should be able to understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
- Student should be able to come up with analysis of efficiency and proofs of correctness.

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists
Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.
Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

### REFERENCES:
COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Understand the implementation of symbol table using hashing techniques.
2. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. Develop algorithms for text processing applications.
4. Identify suitable data structures and develop algorithms for computational geometry problems.

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ITITMC15  RESEARCH METHODOLOGY AND IPR  L  T  P  C
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Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.
Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations
Effective literature studies approaches, analysis Plagiarism, Research ethics
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
Patent information and databases. Geographical Indications.
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.
REFERENCES:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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COURSE OBJECTIVES:
• To acquire the knowledge of using advanced tree structures.
• To learn the usage of heap structures.
• To understand the usage of graph structures and spanning trees.
• To learn the working of various string matching algorithms.
LIST OF EXERCISES

1. Implementation of a Binary Search Tree.
2. Red-Black Tree Implementation.
3. Heap Implementation.
4. Binomial Heaps.
5. Graph Traversals.
7. Shortest Path Algorithms.
10. Implementation of Singly Linked List (addition, deletion, insertion in all positions)
11. Implementation of Doubly Linked List (addition, deletion, insertion in all positions)
12. Implementation of Quick sort, Merge sort, Shell sort
13. Implementation of Depth First Search
14. Applications of Linked List, Stack and Queue in real world

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
1. Design and implement basic and advanced data structures extensively.
2. Design algorithms using graph structures.
3. Design and develop efficient algorithms with minimum complexity using design techniques.

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23
COURSE OBJECTIVES:

- To study various network simulators
- To study about Client / Server communication
- To study about file transfer and multicasting

LIST OF EXERCISES

1. Study of network simulators like NS2, Glomosim, OPNET.
2. Implementation of client-server communication using TCP.
3. Implementation of UDP client server communication using bind, Sendto, Recvfrom system call.
5. Implementation of Domain Name Space.
7. Simulation of ARP/RARP.
8. Implementation of Peer – to – peer communication using UDP
9. Implementation of Socket program for UDP Echo Client and Echo Server
10. Implementation of file transfer from Client to Server
11. Implementation of Client Server Application for chat
12. Client Server Communication using Object Stream
13. Client Server Communication using Byte Stream
14. Implementation of Online test for a single client
15. Java Multicast Programming

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
1. Implement Client / Server communication.
2. Understand network simulators.
3. Understand multicast programming.

Mapping with Programme Outcomes

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24
COURSE OBJECTIVES:

- Introduce students to the advanced methods of designing and analyzing algorithms.
- The student should be able to choose appropriate algorithms and use it for a specific problem.
- To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
- Students should be able to understand different classes of problems concerning their computation difficulties.
- To introduce the students to recent developments in the area of algorithmic design.

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.


Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.


Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

One or more of the following topics based on time and interest

- Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm
- Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

REFERENCES:
1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms"
3. Kleinberg and Tardos, 'Algorithm Design'

**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to
1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.
4. Students should have an insight of recent activities in the field of the advanced data structure.

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**COURSE OBJECTIVES:**

- To learn and implement the computational approaches to Modeling, Feature Extraction.
- To grasp the various search algorithms applicable to Big Data.
- To comprehend the necessity and application of Map Reduce.
- To evaluate and infer streaming data.
- To acquire knowledge of how to handle large data sets.


Big data from different perspectives - Big data from business Perspective: Introduction of big data-Characteristics of big data-Data in the warehouse and data in Hadoop- Importance of Big data- Big data Use cases: Patterns for Big data deployment. Big data from Technology Perspective: History of Hadoop-Components of Hadoop-Application Development in Hadoop-Getting your data in Hadoop-other Hadoop Component.


Processing your data with mapreduce - Getting to know MapReduce – MapReduce Execution Pipeline – Runtime Coordination and Task Management – MapReduce Application – Hadoop Word Count Implementation.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Identify the need for big data analytics for a domain.
2. Use Hadoop, Map Reduce Framework.
3. Apply big data analytics for a given problem.

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COURSE OBJECTIVES:
- To understand setting up of Hadoop Cluster.
- To solve problems using Map Reduce Technique.
- To solve Big Data problems.

**LIST OF EXERCISES**

**Cycle I – Data Mining Using Weka**
1. Identifying Rules and important Attributes.
2. Executing Classification Algorithms.
3. Deletion of Attribute, Cross Validation and Visualizing.
4. Perform Test Case Scenario.
5. Use Pruning and Reduced Error Pruning.
6. Compare different Classification Algorithms.
7. Clustering Algorithm.
8. Association Rule Mining.

**Cycle II – Python Programming**
1. Perform Fibonacci Sequence.
2. Calculate Area for Square, Rectangle and Circle.
3. Run a Test of Knowledge.
4. Finding most frequent words in a text read from a file.

**Cycle III – Hadoop**
1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
2. Map Reduce application for word counting on Hadoop cluster.
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
5. Page Rank Computation.
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.

**COURSE OUTCOMES:**
Upon of completion of this course, students will be able to
1. Set up multi-node Hadoop Clusters.
2. Apply Map Reduce algorithms for various algorithms.
3. Design new algorithms that uses Map Reduce to apply on Unstructured and structured data.

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28
COURSE OBJECTIVES:

- To train the students in the field work related to Information Technology and to have a practical knowledge in carrying out the Information Technology related problems.
- To train and develop skills in solving problems during execution of the problems related to Information Technology.
- To work on a technical topic related to Information Technology and acquire the ability of written and oral presentation.
- To acquire the ability of writing technical papers for Conferences and Journals.

The students will individually undertake a training program in reputed concerns in the field of Information Technology during summer vacation (at the end of second semester for Full Time / Fifth semester for Part – Time) for a minimum stipulated period of four weeks. At the end of training the student has to submit the detailed report on the training undertaken within ten days from the commencement of the third semester for Full Time / Fifth semester for Part – Time. The student will be evaluated by a team of staff members nominated by the Head of the Department through a viva-voce examination.

The students will work for two periods per week guided by student counselor. They will be asked to present a seminar of not less than 15 minutes and not more than 30 minutes on any technical topic of student’s choice related to Information Technology and to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation, the report and also on the interaction shown during the seminar.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Apply prior acquired knowledge in problem solving and to demonstrate the use, interpretation and application of an appropriate international Information Technology standard in a specific situation.

2. Analyze a given Information Technology problem and to identify and implement appropriate problem-solving methodology to propose a meaningful solution.

3. Present the solution acquired in the form of written and oral presentation.

4. Face the audience and to interact with them confidently.
5. Acquire the ability to work in the actual environment and to use the technical resources.

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COURSE OBJECTIVES:
- To train the students in the current thrust area in Information Technology and to have practical knowledge in handling the technical scenario.
- To develop skills on the research topic and to implement the appropriate methods to handle the issue.

The students will individually undertake a research problem in the field of Information Technology in the third semester for Full-Time / Fifth semester for Part-Time. The student will be guided by a staff member. The progress of the research will be evaluated every month by a team of staff members. The student has to submit the detailed report on the research problem at the end of Third semester for Full-Time / Fifth semester for Part-Time. The student will be evaluated by a team of examiners nominated by the Head of the Department through a viva-voce examination.

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Conduct independent empirical research to evaluate and present their results responsibly and critically.
2. Present the conclusions with understandability using appropriate tables and graphs in the form of report.
3. Maintain the ethical standards of scientific research and to follow the basic principles in an academic community that requires constant learning and knowledge updation.

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### COURSE OBJECTIVES:
- To train the students in the current thrust area in Information Technology and to have practical knowledge in handling the technical scenario.
- To develop skills on the research topic and to implement the appropriate methods to handle the issue.

The students will continue the research problem undertaken during third semester for Full-Time / Fifth semester for Part-Time in the field of Information Technology. The student will be guided by a staff member. The progress of the research will be evaluated every month by a team of staff members. The student has to submit the detailed report on the research problem at the end of Fourth semester for Full-Time / Sixth semester for Part-Time. The student will be evaluated by a team of examiners nominated by the Head of the Department through a viva-voce examination.

### COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Conduct independent empirical research to evaluate and present their results responsibly and critically.
2. Present the conclusions with understandability using appropriate tables and graphs in the form of report.
3. Maintain the ethical standards of scientific research and to follow the basic principles in an academic community that requires constant learning and knowledge updation.

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### PROGRAM ELECTIVES

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### COURSE OBJECTIVES:
- To provide an introduction to the principles and practices of Network Engineering.
• To understand the architecture of the network devices.
• To explore the emerging technologies in network engineering.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Gain an understanding of the principles of network engineering.
2. Knowledge of advanced network engineering concepts and techniques.
3. Explore the emerging technologies in network engineering.
### COURSE OBJECTIVES:

- To provide information about wider engineering issues that form the background to developing complex, evolving (software-intensive) systems.
- To plan a software engineering process to account for quality issues and non-functional requirements.
- To employ a selection of concepts and techniques to complete a small-scale analysis and design in mini projects.
- To impart knowledge to translate requirement specifications into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- To provide basic knowledge about software project management.


REFERENCES:


COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
1. Learn UML models and tools.
2. Apply design patterns on various applications.
3. Understand the concepts and techniques to complete a small-scale analysis and design in mini projects.

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COURSE OBJECTIVES:

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
- To implement soft computing based solutions for real-world problems.
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
- To provide student an hand-on experience on MATLAB to implement various strategies.
INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS:


NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks


Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm.
Implementation of recently proposed soft computing techniques.

REFERENCES:
3. MATLAB Toolkit Manual

COURSE OUTCOMES

Upon Completion of the course, the students will be able to
1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem.

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COURSE OBJECTIVES:

- To understand the basics of Mobile Computing and Personal Computing.
- To learn the role of cellular networks in Mobile and Pervasive Computing.
- To expose to the concept of sensor and mesh networks.
- To expose to the context aware and wearable computing.
- To learn to develop applications in mobile and pervasive computing environment.


REFERENCES:


**COURSE OUTCOMES:**

Upon Completion of the course, the students will be able to
1. Design a basic architecture for a pervasive computing environment.
2. Design and allocate the resources on the 3G-4G wireless networks.
3. Analyze the role of sensors in Wireless networks.
4. Work out the routing in mesh network.
5. Deploy the location and context information for application development.

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38
COURSE OBJECTIVES:

- To provide insight to the mathematical formulation of real world problems.
- To optimize these mathematical problems using nature based algorithms.
  And the solution is useful specially for NP-Hard problems.
- To introduce recent trends and applications in optimization.
  Engineering application of Optimization, Formulation of design problems as
  mathematical programming problems.
  General Structure of Optimization Algorithms, Constraints, The Feasible
  Region.
  Branches of Mathematical Programming: Optimization using calculus,
  Graphical Optimization, Linear Programming, Quadratic Programming, Integer
  Programming, Semi Definite Programming.
  Optimization Algorithms like Genetic Optimization, Particle Swarm
  Optimization, Ant Colony Optimization etc.
  Real life Problems and their mathematical formulation as standard
  programming problems.
  Recent trends: Applications of ant colony optimization, genetics and linear and
  quadratic programming in real world applications.

REFERENCES:

2. Andreas Antoniou, “Practical Optimization Algorithms and Engineering
   Applications”.
4. Dimitris Bertsimas; Robert Weismantel, “Optimization over integers,
   2006.
7. Michael Jünger, Thomas M. Liebling, Denis Naddef, George Nemhauser,
   William R. Pulleyblank, Gerhard Reinelt, Giovanni Rinaldi, Laurence A.
   Wolsey, “50 Years of Integer Programming 1958-2008: From the Early Years

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
1. Formulate optimization problems.
2. Understand and apply the concept of optimality criteria for various types of
   optimization problems.
3. Solve various constrained and unconstrained problems in Single variable as
   well as multivariable.
4. Apply the methods of optimization in real life situation.
## Mapping with Programme Outcomes

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## COURSE OBJECTIVES:

- To identify the components of managing the data center and understand logical and Physical components of a storage infrastructure.
- To evaluate storage architectures including storage subsystems SAN, NAS, IPSAN, CAS.
- To understand the business continuity, backup and recovery methods.

Introduction to Information Storage Management - Data Center Environment Database Management System (DBMS) - Host - Connectivity –Storage-Disk Drive Components- Intelligent Storage System -Components of an Intelligent Storage System- Storage Provisioning- Types of Intelligent Storage Systems.


REFERENCES:


COURSE OUTCOMES:

Upon completion of this course the students may be able to

1. Provide a variety of solutions for storing, managing, accessing, protecting, securing, sharing and optimizing information.
2. Evaluate storage architectures, including storage subsystems SAN, NAS, IPSAN, CAS.
3. Understand the business continuity, backup and recovery methods.

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COURSE OBJECTIVES:

- To learn about the issues in the design of ad hoc and wireless sensor networks.
- To understand the working of protocols in different layers of ad hoc and sensor networks.
- To expose the students to different aspects in ad hoc and sensor networks.
- To understand various standards and applications in ad hoc and sensor networks.


Goals and Figures of Merit, Design Principles for WSNs, Service Interfaces of WSNs, Gateway Concepts.


REFERENCES:


COURSE OUTCOMES:

Upon completion of this course students should be able to
1. Identify different issues in wireless ad hoc and sensor networks.
2. Analyze the protocols developed for ad hoc and sensor networks.
3. Identify and discuss the standards and applications of ad hoc and sensor networks.

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42
COURSE OBJECTIVES:

- To learn the importance of semantic web.
- To understand various semantic knowledge representation strategies.
- To learn the concepts of ontology.
- To learn the ontology related tools.


REFERENCES:


**COURSE OUTCOMES:**

Upon completion of the course, the students will be able to
1. Compare conventional web with semantic web.
2. Analyze and design semantic knowledge representation modes.
3. Construct ontology using different tools.
4. Use semantic web services with web applications.

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**COURSE OBJECTIVES:**

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of advanced data models.

Database System Architectures: Centralized and Client-Server Architectures – Server System


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Develop in-depth understanding of relational databases and skills to optimize database performance in practice.
2. Understand and critique on each type of databases.
3. Design faster algorithms in solving practical database problems.
Mapping with Programme Outcomes

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COURSE OBJECTIVES:

- To enable the student to understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods in vogue.
- To expose the student to the advances in packet switching in the optical domain, the associated challenges and the possible solution approaches.
- To introduce to high capacity networks.


Optical Network Architectures – Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks- Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture. Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures, Ring architectures, Network Management.


High Capacity Networks, Network Design and Management – SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and
demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test bed. Transmission system Engineering-system model, Power penalty-transmitter, receiver, Optical amplifiers, crosstalk, dispersion, wavelength stabilization; overall design consideration; Control and Management-Network manage functions, Configuration management, Performance management, Fault management. Optical safety, Service interface.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Learn the importance of the backbone infrastructure for our present and future communication needs.
2. Familiarize with the architectures and the protocol stack in use.
3. Understand the differences in the design of routing, switching and the resource allocation methods.

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COURSE OBJECTIVES:
• To be able to understand the Cluster installation and configuration.
• To understand the Parallel programming models & paradigms.
• To familiarize with Job management system and cluster scheduling process.

Overview of cluster computing: Elements of cluster, requirements-classes of cluster- Hardware system structure- Node software- Node hardware: Mother board,
Memory, Basic Input Output Stream-Peripheral Component Interconnect (PCI) bus, Node assembly.


Parallel programming with Message Passing Interface (MPI): MPI compilation and running process, Implementation of MPI for clusters-Dynamic process management-Fault tolerance-RMA - Performance measurement - Parallel Virtual Machine (PVM): Overview, Setup, console details Extended PVM.

Goal of workload management software- management activities-Distributed job scheduler-condor: features, architecture- Installation-Configuration – Administration tools.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Learn the Cluster installation and configuration methods and tools.
2. Understand the Parallel programming models & paradigms.
3. Familiarize the job management system and cluster scheduling process.

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48
COURSE OBJECTIVES:

- To apply trust-based security model to real-world security problems.
- An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.
- Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.

Introduction to Cloud Computing: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing


Cloud Deployment Models: Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise


Identity and Access Management: Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management


Audit and Compliance: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud

ADVANCED TOPICS: Recent developments in hybrid cloud and cloud security
REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Identify security aspects of each cloud model
2. Develop a risk-management strategy for moving to the Cloud
3. Implement a public cloud instance using a public cloud service provider
4. Apply trust-based security model to different layer

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COURSE OBJECTIVES:
- To acquire knowledge to adopt green computing practices.
- To understand how to minimize equipment disposal requirements.
- To introduce Socio-cultural aspects of Green IT.


The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Minimize negative impacts on the environment.
2. Develop skill in energy saving practices in their use of hardware.
3. Examine technology tools that can reduce paper waste and carbon footprint by user.

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51
COURSE OBJECTIVES:

- The course will provide an insight of basic of quantum physics from a computer scientist’s perspective, and how it describes reality and understand the philosophical implications of quantum computing.
- To study about Tensor products and Quantum measurement.
- To introduce recent trends in Quantum Computing theory.

Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt orthogonalization, bra-ket formalism, the Cauchy-Schwarz and triangle Inequalities.


Commutator Algebra, Heisenberg uncertainty principle, polar decomposition & singular values, Postulates of Quantum Mechanics.

Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices.


Recent trends in Quantum Computing Research, Quantum Computing Applications of Genetic Programming.

REFERENCES:

1. Zdzislaw Meglicki, “Quantum Computing without Magic”
2. DAVID Mc MAHON, “Quantum Computing Explained”
3. Marco Lanzagorta, Jeffrey Uhlmann, “Quantum Computer Science”
4. Phillip Kaye, Raymond Laflamme, Michele Mosca, “An Introduction to Quantum Computing”

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. knowledge of Vector spaces, Matrices, Quantum state, Density operator and Quantum Measurement theory.
2. Understand and explain the basic notions of Quantum Computing - including Quantum Bits and registers, Quantum Evolution, Quantum
Circuits, Quantum Teleportation and the basic Quantum Algorithms known at the present time.

3. Identify the essential difference between the classical paradigm and the quantum paradigm of computation and appreciate why quantum computers can solve currently intractable problems.

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**COURSE OBJECTIVES:**

- To understand the mathematics behind Cryptography.
- To understand the standard algorithms used to provide confidentiality, integrity and authenticity.
- To get the knowledge of various security practices applied in the field of information technology.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students should be able to
1. Apply the basic security algorithms required by any computing system.
2. Predict the vulnerabilities across any computing system.
3. Design a security solution for any computing system.

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COURSE OBJECTIVES:
- To understand the issues involved in mobile communication system design and analysis.
- To understand the concept of frequency reuse.
- To understand the characteristics of wireless channels.

Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity –Capacity comparisons – Capacity of Frequency Selective Fading channels.


Data Transmission using Multiple Carriers – Multicarrier Modulation with Overlapping Subchannels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak to average Power Ratio-Frequency and Timing offset – Case study IEEE 802.11a.


**REFERENCES:**


**COURSE OUTCOMES:**

Upon Completion of the course, the students will be able to

1. Acquire knowledge in different modulation schemes and its error probability in wireless system.
2. Learn the fundamental limits on the capacity of wireless channels.
3. Understand the diversity concepts.

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COURSE OBJECTIVES:

- To understand the basics of Internet of Things.
- To get an idea of some of the application areas where Internet of Things can be applied.
- To understand the middleware for Internet of Things.
- To understand the concepts of Web of Things.
- To understand the IOT protocols.


REFERENCES:
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles - (Eds.) – Springer – 2011.
4. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley – 2012.

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Identify and design the new models for market strategic interaction.
2. Design business intelligence and information security for WoB.
3. Analyze various protocols for IoT.
4. Design a middleware for IoT.

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COURSE OBJECTIVES:
- To gain knowledge about medical informatics and healthcare informatics.
- To understand the case study of computerized patient record.
- To study and use different tools for clinical information system.
- To apply the knowledge of Bio informatics for systems.


Strategic Planning - Selecting a Health Care Information System - Systems Integration and Maintenance - Systems Integration - Regulatory and Accreditation Issues - Contingency Planning and Disaster Recovery.

Introduction - History taking by Computer, Dialogue with the Computer - Components and Functionality of CPR - Development Tools – Intranet - CPR in
Radiology - Application Server Provider - Clinical Information System - Computerized Prescriptions for Patients.


REFERENCES:

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
1. Design and develop clinical and hospital management system on their own.
2. Work with different medical imaging techniques.
3. Apply the knowledge of bio informatics for biological databases. Learn hybrid representations and its Applications.

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COURSE OBJECTIVES:
- To understand the basic issues and types of text mining.
- To appreciate the different aspects of text categorization and clustering.
- To understand the role played by text mining in Information retrieval and extraction.
- To appreciate the use of probabilistic models for text mining.
- To appreciate the current trends in text mining.


REFERENCES:
COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Understand the basic concepts of text mining in Information retrieval and extraction.
2. Apply probabilistic models for text mining.
3. Learn the current trends in text mining.

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COURSE OBJECTIVES:
- To learn the concept of how to learn patterns and concepts from data.
- To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- To Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Supervised Learning (Regression/Classification) : Basic methods: Distance-based methods, Nearest - Neighbours, Decision Trees, Nave Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models - Support Vector Machines, Nonlinearity and Kernel Methods - Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unsupervised Learning : Clustering: K-means/Kernel K-means - Dimensionality Reduction: PCA and kernel PCA - Matrix Factorization and Matrix Completion - Generative Models (mixture models and latent factor models)

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference
Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

REFERENCES:
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning, Springer 2009 (freely available online)

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
1. Extract features that can be used for a particular machine learning approach.
2. Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
3. Analyse various machine learning approaches and paradigms.

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COURSE OBJECTIVES:
- To understand and apply Reliability Mathematics to hardware and software systems.
- To understand evolution of software reliability growth models.
- To understand and apply Non-homogeneous Poisson Software Reliability Growth Models.
- Basic Concepts – Failure and Faults-Introduction to Software Reliability Growth Models (SRGMs)-General Model Characteristic-Historical Development of modelsModel Classification scheme-white box and black box models-models for
application during operational phase and testing phase-Markovian models-Jelinski-Moranda model-Goel-Okumoto imperfect debugging model.


REFERENCES:

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
1. Understand the need for flexible models.
2. Understand the quality metrics producing models.

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COURSE OBJECTIVES:
- To learn various generations of wireless and cellular networks.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA- CDMA 1X – WCDMA.

LTE: Introduction, Radio interface architecture - Physical layer, Access procedures - System
   Architecture Evolution (SAE) - Communication protocols – Interfaces- LTE Advanced.


REFERENCES:

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
1. Understand Wi MAX networks, protocol stack and standards.
2. Understand the emerging trends of smart phones.
3. Analyze latest standards like DLNA, NFC and femtocells.

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COURSE OBJECTIVES:

- To understand the basic concepts and algorithms of digital processing.
- To familiarize the student with the image processing environments like MATLAB and its equivalent Biometric Image processing environments.
- To expose the students to a broad range of Biometric image processing techniques and issues and their applications, and to provide the student with practical experiences using them.


Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges -Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification, Matching policies.

Detection and Location of Faces: Statistics-Based method, Knowledge-Based method - Feature Extraction and Face Recognition: Gray value Based method, Geometry Feature Based method, Neural Networks method.


Introduction to Multibiometric - Information Fusion in Biometrics - Issues in Designing a Multibiometric System - Sources of Multiple Evidence - Levels of Fusion in Biometrics - Sensor level, Feature level, Rank level, Decision level fusion - Score level Fusion.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Design an application that incorporates different concepts of Biometric Image processing.
2. Apply and explore new techniques in the areas of Biometric image enhancement, restoration, segmentation, compression, wavelet processing and image morphology.
3. Explore the possibility of applying Biometric image processing concepts in various domains.

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COURSE OBJECTIVES:
- To provide scientific foundations needed for the design, implementation, and evaluation of large scale biometric identification systems.
- To study physiological Biometric technologies.
- To study behavioural biometric technologies and multi Biometrics.

Biometrics - Introduction - benefits of biometrics over traditional authentication systems - benefits of biometrics in identification systems - selecting a biometric for a system - Applications - Key biometric terms and processes - biometric matching methods - Accuracy in biometric systems.


Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens - executive decision - implementation Plan.
Case studies on Physiological, Behavioral and multifactor biometrics in identification systems.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Design biometric identification systems.
2. Implement biometric identification systems.
3. Evaluate large scale biometric identification systems.

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ITITPESCN DISTRIBUTED SYSTEMS SECURITY

COURSE OBJECTIVES:
- To explore the design and implementation of distributed systems.


Application-Layer Vulnerabilities - Injection Vulnerabilities - Cross-Site Scripting (XSS) - Improper Session Management - Improper Error Handling - Improper Use of Cryptography - Insecure Configuration Issues - Denial of Service - Canonical Representation Flaws - Overflow Issues. Service-Level Threats and Vulnerabilities: SOA and Role of Standards - Service-Level Security Requirements -
Service-Level Threats and Vulnerabilities - Service-Level Attacks - Services Threat Profile.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Understand the computer system security.
2. Understand the Security Appliances and Virtualization.
3. Understand the Services Security Policy.

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COURSE OBJECTIVES:

- To gain and understand the complete knowledge of threats within wireless environments.
- To recognize typical vulnerabilities and safeguards for wireless communication to include; Cellular and Personal Communications Services (PCS) network security, secure wireless encrypted e-mail solution, Wireless handheld device security, PAN and LAN security.


Wireless Device security issues - CDPD security (Cellular Digital Packet Data)-GPRS security (General Packet Radio Service) - GSM (Global System for Mobile Communication) security – IP security.


REFERENCES:


COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the complete knowledge of threats within wireless environments.
2. Understand the Wireless Device security issues.
3. Understand the basic specifications, Bluetooth security.
## Mapping with Programme Outcomes

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### ITITPESCN AUDIO PROCESSING

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### COURSE OBJECTIVES:

- To study the characteristics of speech
- To study about speech analysis and synthesis
- To study about Linear Predictive coding, speech coding & Recognition

**Principle Characteristics of Speech**

Linguistic information, Speech and Hearing, Speech production mechanism, Acoustic characteristic of speech

**Statistical Characteristics of speech**

Speech production models, Linear Separable equivalent circuit model, Vocal Tract and Vocal Cord Model.

**Speech Analysis and Synthesis Systems**

Digitization, Sampling, Quantization and coding, Spectral Analysis, Spectral structure of speech, Autocorrelation and Short Time Fourier transform, Window function, Sound Spectrogram, Mel frequency Cepstral Coefficients, Filter bank and Zero Crossing Analysis, Analysis – by-Synthesis, Pitch Extraction.

**Linear Predictive Coding Analysis**


**Speech Coding**

Reversible coding, Irreversible coding and Information rate distortion theory, coding in time domain: PCM, ADPCM, Adaptive Predictive coding, coding in Frequency domain: Sub band coding, Adaptive transform coding, Vector Quantization, Code Excited Linear Predictive Coding (CELP).

**Speech Recognition**


**Speaker recognition**


### REFERENCES:

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
1. Understand different characteristics of Speech.
2. Identify and analyze different speech analysis system.
3. Write algorithms for Recognition of speech.

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COURSE OBJECTIVES:
• To study the sensor characteristics and the fundamental principles of sensing.
• To understand the sensor interface electronics.
• To study selected motion-related sensors.
• To study light and radiation detectors.
• To study selected temperature sensors.
• To study selected chemical sensors.


Light Detectors: Photo diodes – photo transistor – photo resistor – cooled detectors – CCD and CMOS image sensors – thermal detectors – optical design – gas flame detectors
Radiation Detectors: scintillating detectors – ionization detectors – cloud and bubble chambers.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Explain sensor characteristics, physics of sensors, optical components of sensors.
2. Apply sensor interface electronics.
3. Choose and use appropriate motion-related sensors, light and radiation detectors, temperature sensors and chemical sensors.

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ITITPESCN | ADVANCED WIRELESS AND MOBILE NETWORKS | L | T | P | C |
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COURSE OBJECTIVES:
- The students should get familiar with the wireless/mobile market and the future needs and challenges.
- To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
- To learn how to design and analyse various medium access
• To learn how to evaluate MAC and network protocols using network simulation software tools.
• The students should get familiar with the wireless/mobile market and the future needs and challenges.

**INTRODUCTION:**

**WIRELESS LOCAL AREA NETWORKS:**
IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues

**WIRELESS CELLULAR NETWORKS:**

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview

**WIRELESS SENSOR NETWORKS**
Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

**WIRELESS PANs**
Bluetooth AND Zigbee, Introduction to Wireless Sensors,

**SECURITY**

**ADVANCED TOPICS**
IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

**REFERENCES:**
1. Schiller J., Mobile Communications, Addison Wesley 2000
2. Stallings W., Wireless Communications and Networks, Pearson Education 2005
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200
COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Design wireless networks exploring trade-offs between wire line and wireless links.
5. Develop mobile applications to solve some of the real world problems.

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COURSE OBJECTIVES:

- The objective of this course is to introduce data warehousing and mining techniques.
- Application of data mining in web mining, pattern matching and cluster analysis.
- To study recent trends in Distributed Warehousing and Data Mining.

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;

Mining Data Streams, Methodologies for stream data processing and stream datasystems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;
Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, automatic classification of web documents and web usage mining; Distributed Data Mining.

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis

REFERENCES:

COURSE OUTCOMES
Upon completion of the course, the students will be able to
1. Study different sequential pattern algorithms
2. Study the techniques to extract patterns from time series data and their application in real world.
3. Extend the graph mining algorithms to web mining
4. Identify the computing framework for Big Data

| Mapping with Programme Outcomes |
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ITITPESCN ADVANCED MACHINE LEARNING

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COURSE OBJECTIVES:
- To introduce key concepts in pattern recognition and machine learning; including specific algorithms for classification, regression, clustering and probabilistic modeling.
- To give a broad view of the general issues arising in the application of algorithms to analysing data, common terms used, and common errors made if applied incorrectly.
- To demonstrate a toolbox of techniques that can be immediately applied to real world problems, or used as a basis for future research into the topic.

Key concepts, Supervised/Unsupervised Learning, Loss functions and generalization, Probability Theory, Parametric vs Non-parametric methods,
Elements of Computational Learning Theory Ensemble Learning, Bagging, Boosting, Random Forest


Bayesian methods for using prior knowledge and data, Bayesian inference, Bayesian Belief Networks and Graphical models, Probabilistic Latent Semantic Analysis, The Expectation-Maximisation (EM) algorithm, Gaussian Processes

Dimensionality Reduction - CCA, LDA, ICA, NMF – Canonical Variates - Feature Selection vs Feature Extraction


Recent trends in supervised and unsupervised learning algorithm, dimensional reducibility, feature selection and extraction

REFERENCES:
1. Christopher M. Bishop, Pattern Recognition and Machine Learning.

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Key concepts, tools and approaches for pattern recognition on complex data sets
2. Kernel methods for handling high dimensional and non-linear patterns
3. State-of-the-art algorithms such as Support Vector Machines and Bayesian networks
4. Solve real-world machine learning tasks: from data to inference
5. Theoretical concepts and the motivations behind different learning frameworks

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COURSE OBJECTIVES:

- To give students knowledge of non-traditional optimization and fundamentals of metaheuristic optimization algorithms.
- To study about Genetic algorithms, PSO, Artificial Ant and Bee algorithms.
- To introduce multiobjective optimization.


Genetic Algorithms: Historical development, GA concepts – encoding, fitness function, population size, selection, crossover and mutation operators, along with the methodologies of applying these operators. Binary GA and their operators, Real Coded GA and their operators - applications to real world problems.

Differential Evolution: DE as modified GA, generation of population, operators and their implementation.

Particle Swarm Optimization: PSO Model, global best, Local best, velocity update equations, position update equations, velocity clamping, inertia weight, constriction coefficients - accelerated PSO.

Artificial Ant and Bee Algorithms: Behaviour of Ants - Ant Colony Optimization- behaviour of honey bees-artificial bee colony optimization.

Harmony Search Optimization - Firefly Algorithm - behaviour of fireflies - light intensity and attractiveness.

Multi-Objective Optimization: Linear and nonlinear multi-objective problems, convex and non-convex problems, dominance - concepts and properties, Pareto – optimality, Use of Evolutionary Computations to solve multi objective optimization, bi level optimization, Theoretical Foundations.

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Identify and describe metaheuristic algorithms and their roles in solving optimization problems
2. Apply the metaheuristic algorithms in solving various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various metaheuristic optimization approaches for a given problem.

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COURSE OBJECTIVES:
- To study about Digital Image and Video Fundamentals
- To study about Image and Video Enhancement, Restoration, Segmentation and Compression
- To study about Colour Image processing
- To study about Object Recognition

Digital Image and Video Fundamentals: Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms - Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform

Image and Video Enhancement and Restoration: Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, deinterlacing, video resolution enhancement, Image and Video restoration (recovery).

Image and Video Segmentation: Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.
Colour image Processing : Colour fundamentals, Colour models, Conversion of colour models, Pseudo colour image processing, Full colour processing

Image and Video Compression : Lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, SVC), Video Quality Assessment

Object recognition : Image Feature representation and description-boundary representation, boundary descriptors, regional descriptors, feature selection techniques, introduction to classification, supervised and unsupervised learning, Template matching, Bayes classifier

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Learn different techniques for image enhancement, video and image recovery
2. Understand techniques for image and video segmentation
3. Study techniques for image and video compression and object recognition

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COURSE OBJECTIVES:
- To learn about ethical hacking
- To understand the hacking networks and vulnerabilities
- To be familiar with hacking applications

Methodology. Footprinting Tools – Conducting Competitive Intelligence – DNS Zone Transfers – Introduction to Social Engineering – Performing Social Engineering Attacks – Social Engineering Countermeasures

SERVICE SCANNING: Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps - Shell Scripting. Enumeration: Introduction - Enumerating Windows, Symbian, Java OS, Android and NetWare Operating Systems


HACKING APPLICATIONS: Messaging Systems – Web Applications – Mobile Applications - Databases - Reporting Results

REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Understand various ethical hacking and social engineering measures
2. Know about various hacking networks
3. Have an idea about the various vulnerabilities

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COURSE OBJECTIVES:

- Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.

Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case

Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

REFERENCES:


COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand relevant legislation and codes of ethics.
2. Analyze various processes, policies and procedures of computer forensics.
4. Gain knowledge on Email and network forensics.
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**COURSE OBJECTIVES:**

- Be familiar with both the theoretical and practical aspects of computing with images.
- Have described the foundation of image formation, measurement, and analysis.
- Understand the geometric relationships between 2D images and the 3D world.
- Grasp the principles of state-of-the-art deep neural networks.
  - Overview, computer imaging systems, lenses, Image formation and sensing,
  - Image analysis, pre-processing and Binary image analysis
  - Edge detection, Edge detection performance, Hough transform, corner detection
  - Segmentation, Morphological filtering, Fourier transform
  - Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing
  - Pattern Analysis:
    - Clustering: K-Means, K-Medoids, Mixture of Gaussians
    - Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised
    - Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.
    - Recent trends in Activity Recognition, computational photography, Biometrics.

**REFERENCES:**


**COURSE OUTCOMES:**

- Upon Completion of the course, the students will be able to
  a. Understand and master basic knowledge, theories and methods in computer vision.
  b. Identify, formulate and solve problems in computer vision.
  c. Analyze, evaluate and examine existing practical computer vision systems.
  d. Design and develop practical and innovative computer vision applications or systems.
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COURSE OBJECTIVES:

- To understand the issues in the design of web application development.
- To learn the concepts of client side and server side technologies.
- To learn the concept of three tier application using MVC.


REFERENCES:


COURSE OUTCOMES:
Upon Completion of the course, the students should be able to
1. Design and develop web applications using various models.
2. Develop web application using HTML and scripting technologies.
3. Develop web application with advanced features.

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COURSE OBJECTIVES:
To understand how Decision Management Systems can transform the business.
To plan the systems with the decision in mind.
To identify, model and prioritize the decisions.
Principles of Decision Management Systems - Begin with the Decision in Mind - Be Transparent and Agile - Be Predictive, Not Reactive - Test, Learn, and Continuously Improve.
Enablers for Decision Management Systems - People Enablers - The Three-Legged Stool - A Decision Management Center of Excellence - Organizational Change - Process Enablers - Managing a Decision Inventory - Adapting the Software Development Lifecycle - Decision Service Integration Patterns - Moving to Fact-Based Decisioning - The OODA Loop - Technology Enablers.
REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students should be able to
1. Design and implement robust decision services.
2. Monitor ongoing decision-making.
3. Learn methods to improve decision making performance.

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COURSE OBJECTIVES:
- To study the fundamentals of computer forensics.
- To have an overview of techniques for Data Recovery and Evidence Collection.
- To study various threats associated with security and information warfare.
- To study the tools and tactics associated with cyber forensics.


REFERENCES:

COURSE OUTCOMES:
Upon completion of the course, the students should be able to
1. Study the fundamentals of computer forensics.
2. Have an overview of techniques for Data Recovery and Evidence Collection.
3. Study various threats associated with security and information warfare.
4. Study the tools and tactics associated with cyber forensics.

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COURSE OBJECTIVES:
• To know the fundamental concepts of data science and analytics.
• To learn various techniques for mining data streams.
• To learn Event Modelling for different applications.
• To know about Hadoop and Map Reduce procedure.

Introduction to Data Science – Applications - Data Science Process – Exploratory Data analysis – Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic
Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools -
Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference -
Prediction Error.

Correlation – Regression – Probability – Conditional Probability – Random
Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness,
Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling -
Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis
of Time Series: Linear Systems Analysis - Nonlinear Dynamics.

Rule Induction - Neural Networks: Learning and Generalization - Competitive
Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting
Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search
Methods- Neuro-Fuzzy Modelling – Association rule mining – Clustering – Outlier
Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web
mining.

Introduction To Streams Concepts – Stream Data Model and Architecture -
Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting
Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a
Window – Decaying Window - Real time Analytics Platform(RTAP) Applications -
Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud
databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data
Analysis Techniques – Interaction Techniques – Social Network Analysis – Collective
Inferencing – Egonets - Systems and Applications.

REFERENCES:
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”
4. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second
6. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly Publishers,
2013.
8. S. N. Sivanandam, S. N Deepa, “Introduction to Neural Networks Using Matlab

COURSE OUTCOMES:

Upon the completion of the course the student should be able to
1. Work with big data platform and its analysis techniques.
2. Design efficient algorithms for mining the data from large volumes.
3. Apply hadoop architecture.
COURSE OBJECTIVES:

- To introduce the theoretical fundamentals of recognition.
- To examine variety of recognition models ranging from simple to the more sophisticated.

  Review of probability theory: conditional probability, Bayes theorem, random variables, distribution function, expectation and variance, joint distribution function of multiple random variables, normal distribution.

  Introduction to pattern recognition system, design cycle, introduction to feature extraction and classification, types of learning, Bayesian decision theory, Bayes Classifier, Discriminant functions, Minimum-error-rate classification.

  Parameter estimation methods, Maximum-Likelihood estimation, Gaussian mixture models, Bayesian estimation, Expectation maximization method, Hidden Markov models, Dimension reduction methods, Fisher discriminant analysis, Principal component analysis.

  Non-parametric techniques for density estimation and pattern classification, Parzen-window method, K-Nearest Neighbour method, linear discriminant analysis, Support vector machines.


REFERENCES:


COURSE OUTCOMES:

Upon completion of this course the student will be able to

1. Develop the necessary analytical skills and experiences on pattern recognition
2. Understand statistical models of pattern recognition.
3. Learns supervised unsupervised and reinforcement learning.
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### COURSE OBJECTIVES:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Be aware of mobile Human Computer interaction.
- Learn the guidelines for user interface.


Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.


Recent Trends: Speech Recognition and Translation, Multimodal System

### REFERENCES:

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
1. Explain the capabilities of both humans and computers from the view point of human information processing.
2. Describe typical human computer interaction (HCI) models, styles and various historic HCI paradigms.
3. Apply an interactive design process and Universal design principles to design HCI systems.

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COURSE OBJECTIVES:
- To learn the characteristics of mobile applications.
- To understand the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. To learn the characteristics of mobile applications.
2. To understand the intricacies of UI required by mobile applications.
3. To study about the design aspects of mobile application.

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COURSE OBJECTIVES:
- To understand the basics of Information Retrieval with pertinence to modeling, Query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.

Introduction - Goals and history of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR – Basic IR Models Boolean and vector space retrieval models – Ranked Retrieval – Text similarity metrics –TF IDF (term frequency/inverse document frequency) weighting - Cosine Similarity.


REFERENCES:

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Understand the various applications of Information Retrieval such as Multimedia IR, Web Search.
2. Understand the concepts of digital libraries
3. Understand the collecting and integrating specialized information on the web.
### Mapping with Programme Outcomes

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### ITITOESECN

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**COURSE OBJECTIVES:**

- To understand the middleware technologies and communication protocols for distributed, dependable, and real-time systems.
- To understand the middleware and/or communication protocols.
- To understand a distributed architecture according to distributed communication requirements.
- To understand real-time communication protocols for distributed dependable systems.
- To understand middleware approaches for WSN.


Transaction Processing Fundamentals Isolation Levels, Optimistic Concurrency Control, Transaction APIs, Container Managed Transactions, Messaging Transactions, Queued Transaction Processing, Web Transactions, Advanced Transactions.


Model Driven Middleware Overview of the OMG Model Driven Architecture (MDA), Capabilities of the MDA, Benefits of the MDA, Overview of Model Driven Middleware, Limitations of Using Modeling and Middleware in Isolation, Combining Model Driven Architecture and QoS-enabled Component Middleware.

REFERENCES:
COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
1. Implement the middleware technologies.
2. Implement the communication protocols for distributed communications.
3. Implement the real-time systems.

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AUDIT COURSE – I & II

ENGLISH FOR RESEARCH PAPER WRITING

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COURSE OBJECTIVES:
- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title
- Ensure the good quality of paper at very first-time submission
  - Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
  - Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

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

  Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

  Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission
REFERENCES:

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COURSE OBJECTIVES:

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

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


Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster:

Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

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

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

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

REFERENCES:
2. Sahni, Pardeep Et.Al. (Eds.), “Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.

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COURSE OBJECTIVES:
- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- Enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature
- Alphabets in Sanskrit - Past/Present/Future Tense - Simple Sentences
- Order - Introduction of roots - Technical information about Sanskrit Literature
- Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

REFERENCES:
1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
**COURSE OUTCOMES:**

Upon Completion of the course, the students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

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**COURSE OBJECTIVES:**

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

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


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

**REFERENCES:**


**COURSE OUTCOMES:**

Upon Completion of the course, the students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality
COURSE OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

History of Making of the Indian Constitution: History - Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features


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

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

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

REFERENCES:

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

Upon Completion of the course, the students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

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COURSE OBJECTIVES:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.
  
  Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

  Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

  Evidence on the effectiveness of pedagogical practices - Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

  Professional development: alignment with classroom practices and follow-up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

REFERENCES:


COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

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COURSE OBJECTIVES:

- To achieve overall health of body and mind
- To overcome stress
  - Definitions of Eight parts of yog. (Ashtanga)
  - Yam and Niyam - Do’s and Don’t’s in life - Ahinsa, satya, astheya, bramhacharya and parigraha - Shaucha, santosh, tapa, swadhyay, ishwarpranidhan
  - Asan and Pranayam - Various yog poses and their benefits for mind & body
  - Regularization of breathing techniques and its effects - Types of pranayam
REFERENCES:

1. ‘Yogic Asanas for Group Tarining-Part-I” :Janardan Swami Yogabhyasi Mandal, Nagpur

2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

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COURSE OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Neetisatakam - Holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) - Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (don’ts) - Verses- 71,73,75,78 (do’s)

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

Statements of basic knowledge - Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 - Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of Role model.

Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 - Chapter18 – Verses 37,38,63

REFERENCES:

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

2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath

3. Rashtriyaa Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.